MODIFICATION # 2
TO
CONTRACT NUMBER VA-000100-HSMM
BETWEEN THE
COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC.

This MODIFICATION # 2 is an agreement between the Commonwealth of Virginia, hereinafter referred to as "State" or "Commonwealth", and Hayes, Seay, Mattern & Mattern, Inc., hereinafter referred to as "Contractor". This Modification # 2 is hereby incorporated into and made an integral part of the Contract valued at $20,471,568.00.

The purpose of this Modification # 2 is to identify additional services required of the Contractor due to Commonwealth of Virginia budgetary limitations that require changes to the Scope of the Contract.

Both parties agree to the following:

1. Reference: Page 7, Section II., Paragraph L., entitled "Changes to the Contract":

   A. A conceptual work plan is provided as Attachment A to this Modification #2, pages 1 through 6.

   B. The Contractor shall propose contract modification text and cost as provided for in the conceptual work plan to be incorporated in a subsequent contract modification. In order to meet contract timeline schedules, the Contractor may begin tasks associated with the conceptual work plan concurrently with the proposed contract modification text and cost changes.

   C. The Contractor shall provide the proposed contract text and costing document(s) within three (3) weeks of the signing of this Modification #2.

2. Reference Attachment C, entitled "Schedule of Fees/Additional Services": The addition of fees delineated below are being added under the description of Modification #2:

Conceptual Work Plan (Draft and Final)	$ 4,203.00
Modify Contact Text (Includes one (1) Review Meeting)	$32,474.00
Modify Contract Costing (Includes one (1) Review Meeting)	$21,874.00
Total fees for Modification # 2:	**$58,551.00**

Revised Attachment C, Schedule of Fees (2 pages) is provided as Attachment B to this Modification # 2.

The foregoing is the complete and final expression of the parties' agreement to modify Contract VA-000100-HSMM and cannot be modified, except by a writing signed by duly authorized representatives of both parties.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

PERSONS SIGNING THIS CONTRACT ARE AUTHORIZED REPRESENTATIVES OF EACH PARTY TO THIS CONTRACT AND ACKNOWLEDGE THAT EACH PARTY AGREES TO BE BOUND BY THE TERMS AND CONDITIONS OF THE CONTRACT.

HAYES, SEAY, MATTERN & MATTERN	COMMONWEALTH OF VIRGINIA
BY: Cheryl S. Giggetts	BY: Leslie R Carter
NAME: Cheryl S. Giggetts	NAME: Leslie R. Carter
TITLE: Vice President CTA Communications, Inc.	TITLE: Deputy Director, Services
DATE: 2/01/2001	DATE: 2/01/2001

ATTACHMENT A
TO
MODIFICATION #2
TO
CONTRACT #VA-000100-HSMM

Conceptual Work Plan

1. General

HSMM/CTA has been asked to begin work on a modification to Contract VA-000100-HSMM. Generally, the purpose of the modification is to change the following:

A. Prepare a specification to use a single systems integrator that will be responsible for detailed design, furnishing, implementation, and proof of performance of all systems, rather than five separate procurements with up to eight separate vendors as described in the Scope of Services, Page 42. Include also procurement and implementation oversight of the Prime Site building and the backup facility if provided by the single systems integrator. If a Capital Outlay appropriation is to be used for the facility upgrade and new facility, a subsequent procurement may be required in accordance with the Commonwealth of Virginia Construction and Professional Services Manual.

B. Include changes resulting from inclusion of NVA COG LMR Network, IFLOWS, CAPWIN, LOJAK, TCAP, PMARS, and SIRS in the radio network.

C. Include changes resulting from the fact that the existing Mobile Computer Terminals are increased to 431 and will not be integrated with the CAD. The Commonwealth will not provide a viable specification for CTA to revise as previously contracted. Requires development of a functional specification including an untested CAD interface. CTA will be responsible for the coordination between the existing CAD Contractor, PRC, and the systems integrator.

D. Include changes to reflect a competitive procurement negotiation between two short listed offerors, rather than the competitive evaluation process currently in the contract. A provision for additional offerors will also be added.

E. For evaluation and recommendation of viable radio system technology, include changes to reflect testing done on equipment supplied by the offerors at the time of evaluation of the their proposals, rather than having this testing done prior to writing the specifications. Testing is limited to up to two offerors, with an option to add more.

F. Expand the specification to include non-COV ownership of the system infrastructure, with the exception of COV owned tower sites. Include specification for lease management of COV owned tower sites (including also sites not being used for this system upgrade) to generate a revenue stream. Include in the specification options for systems integrator operated networks, maintenance, and partnerships. The prices for the infrastructure upgrade, subscriber equipment, and maintenance will be differentiated by the offerors.

G. Modify wording to further emphasize the fact that HSMM/CTA will develop functional specifications. The current contract clearly states that the specifications will reflect a "Functional Procurement Approach" (Section G2 of the contract describes the approach fully), and while there is no change in scope necessary to reflect that approach, there may be some wording changes desired by the Commonwealth to emphasize this fact.

The specifications are the foundation of the project. They provide the following:

- The technical part of the procurement documents, in order to provide the basis for offerors' proposals and for their evaluation.
- The technical part of the contract, as negotiated and agreed to by the COV.
- The "road map" for implementation, to make sure that the project includes oversight "windows" which provide for inspections, reviews, meetings, reporting, and project documentation. Also to include oversight "hooks" to provide for changes in functional requirements, and other technical changes that may become apparent as the implementation progresses.
- The basis for acceptance, to make sure that the system performs as specified, and according to good engineering design principals.
- The build-out of the remaining phases of the system shall be contingent upon the successful implementation of the pilot system.
- The baseline for systems integrator operations for the life of any COV/systems integrator partnership, presumably lasting up to 20 years. Addressing protection for COV in the event of conflicts between COV agency's mission requirements, systems integrator's commercial needs and the orderly termination of the partnership.

The specifications package CTA will produce for this procurement is not simply a procurement document. It is the foundation, or baseline document that will form the technical part of the contract with the systems integrator, and it will be the definitive document for the implementation of the project, the acceptance of the project, and the operation of the project for the life of the project, which may be in

excess of twenty years. The importance of this single document is critical to the success of the project.

H. Include the ability to allow HSMM/CTA to meet in its Lynchburg office with potential offerors in advance of issuance of the RFP, in order to review their ability to meet the objectives of the RFP and to obtain their comments.

I. Expand meeting schedule to accommodate additional meetings resulting from increased user agency participation (UARC), Commonwealth budget related activity, and other current and projected activities. Increase the yearly project meetings/presentations.

J. Include management oversight of design, layout, and implementation for upgrades of seven VSP Divisional HQ Dispatch Centers to accommodate an increase to eight dispatch/call taker positions.

K. Remove requirement for using one radio for both voice and data, and any references to a mandated trunked architecture.

L. Assist with installation, integration, and testing of PRC provided CAD stations.

M. Increase the number of LMR sites to 47.

N Assist the COV in acquiring additional radio frequencies in VHF, UHF, and 800 MHz and microwave, as well as licensing of narrowband VHF mobile frequencies.

O. Document the current participating agency sites that are not used in the infrastructure, with the intent of using them as revenue sources. This shall also include commercial sites currently in use and/or generating revenues.

2. Timetable

A Project Plan will be developed by the Virginia Department of State Police (VSP) and HSMM/CTA. The Project timetable shall be as mutually agreed between the VSP and HSMM/CTA based upon an agreed upon Project Plan.

3. Specific contract changes.

Task A, No change since this is essentially complete.

Task B, Virginia Frequency Allocation Model (VFAM) will be complete, and HSMM/CTA will at the time of issuance of the RFP be working in development of a channel plan. This is necessary to secure FCC licenses for the sites used in the system. Talk groups will be established in coordination with the COV user groups. CTA had

already assumed the systems integrator would be involved in both activities, and so there will be no change here.

Task C, Minor change since this is essentially complete. Survey two additional LMR sites (increase from 45 to 47). The product of this task will be provided to offerors to use in their design.

Task D, Modified to reflect testing of the technologies will occur as part of the procurement process. The technology report will be issued concurrent with, and as part of, the evaluation of the offerors proposals to include the results of the testing. Testing will be done with up to two offerors, with the more offerors(s) added at the option and specific authorization of the Commonwealth.

Task E, Modified to reflect inclusion in the main RFP. This task will be increased to include design criteria, necessary inspections, review of design drawings, and other general oversight functions.

Also increased to include management oversight of design, layout, and implementation for seven VSP dispatch centers.

Task F, Modified to reflect systems integrator participation in the Migration Plan under CTA oversight. CTA, with the assistance of and review by user agencies, will develop the structure of the migration plan. The systems integrator will produce and update the migration plan under CTA's oversight. The COV will review the plan, and upon agreement, will provide acceptance of the plan. Key oversight elements such as the User Evaluation Period will also remain and possibly be expanded.

Task G, Modified to include a single integrated specification and RFP procurement process. CTA envisions that this will entail an additional sub-task that will integrate the specifications developed under this and other tasks.

Also modified to include the following:

- Assistance to COV in finalizing system operational requirements, including general cost/benefit advice and meetings.
- Addition of NVA COG LMR Network, IFLOWS, CAPWIN, LOJAK, TCAP, PMARS, etc.
- Addition of SIRS (to the extent that the configuration has been determined by the COV no later than March 1, 2001).
- Provision for additional detailed technical evaluations on a per-offeror basis, at the option and direction of the COV.

- Competitive negotiation between two short-listed offerors, as opposed to competitive evaluation.

- Non-COV ownership of infrastructure, and payments to systems integrator on a "per seat" basis.

- Lease management for COV towers, site facilities, and properties (including also sites not being used for this system upgrade).

- The ability for HSMM/CTA to meet with offerors prior to RFP issuance.

- Wording changes to emphasize functional procurement, as requested by COV.

- Wording changes to remove requirements that trunking architecture must be employed. Retain ability of Systems integrator to propose trunking architecture to meet functional requirements.

- Coverage analysis for two additional (existing) LMR sites (45 goes to 47).

- Add assistance in acquiring additional radio frequencies and in licensing of frequencies, including researching availability of LMR frequencies (up to once per LMR radio site), identification of Microwave frequencies (up to once for every two Microwave paths – assuming 50% of the microwave licenses are OK), and licensing VHF narrow-band frequencies for backup communications (up to forty frequencies at each LMR site on a one-time licensing basis). Current number of microwave path designs and surveys will remain the same.

- Develop and maintain database of transmitter sites on state property (COV owned, leased, and commercially owned) outside the Shared network, which may be used for revenue generation. General site characteristics will be included, to the extent that information is provided by COV user agencies (no site visits included). Database to include up to 500 transmitter sites. Will include solicitation of this information from agencies via UARC meetings.

Task H, Modified to develop functional specifications that will include design of network interface in the integrated RFP.

Task I, Modified to establish structural analysis and detailed site design as part of the single systems integrator requirements. HSMM/CTA to provide generic plans, site design review and implementation oversight. This will include meetings, site observations, witness of tests, etc. HSMM/CTA to provide review of systems integrator tower structural modification drawings, and oversight/site observations of actual modifications.

Task J, Modified to accommodate the inclusion of 431 existing MCT units. Design of system interface for MCTs will be changed to reflect the CAD interface. The

Commonwealth will not provide viable specification to CTA as previously contracted. Requires development of a functional specification including an untested CAD interface. Remove requirement for one radio for both voice and data and allow separate but integrated voice and MCT subsystems.

The Intranet vendor will now be part of the Systems integrator team.

Task K, Minor modifications, acceptance testing will now reflect a Systems integrator team rather than individual vendors. Include assistance with installation, integration, and testing of PRC provided CAD stations in 7 VSP Communications Centers.

Task L, Master Project Schedule will require substantial modifications to reflect schedule changes. Schedule may increase as a result of the procurement of a systems integrator. Implementation schedule will receive substantial input from the successful offeror and will be a factor in the negotiation process. Commonwealth budget related activities and Master Budget activities would change as a result of potential public/private ownership and operation to include approaches other than Commonwealth owned, operated and maintained. Additional meetings responding to changes in scope and current increased participation by agencies (UARC) will be included.

Task M, Documentation review is critical no matter who implements or owns the infrastructure. CTA will provide systems integrator structure, guidance, documentation review, and oversight.

Tasks N, O, Modify target dates and milestone schedule to reflect single procurement. HSMM/CTA will strive to maintain or advance the current implementation schedule, however the systems integrator timetable may drive implementation.

Task P, No change.

Task Q, No change.

Task R, No change.

ATTACHMENT B
To
MODIFICATION # 2
To VA-000100-HSMM

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Schedule of Fees

Task	Fee
A. Perform radio asset inventory, needs assessment, and project expected growth.	$295,266
B. Document existing radio frequency authorizations. Devise a frequency reuse strategy. Determine the capacity of the channels. Obtain additional channels if required. Ensure non-interference. Develop a channel plan.	$474,143
C. Evaluate and document the State Police combined radio infrastructure.	$744,849
D. Perform microwave and LMR technologies assessment.	$564,943
E. Design and document the facility upgrade for the network. Design and document the new facility for the network. Transfer operations to the new facility.	$20,684
F. Prepare a migration plan.	$302,523
G. Design an upgrade to the existing VSP LMR and microwave networks. Document the designed coverage of the network. Add any new LMR or microwave sites that are required. Create the required technical procurement documentation. Perform coverage testing on the completed network.	$5,915,223
H. Design a network interface. Create a network interface specification.	$61,752
I. Perform a tower structure analysis. Generate the tower technical procurement, FAA and FCC documentation.	$4,657,062
J. Integrate existing mobile data equipment into the upgraded radio network. Integrate mobile data infrastructure into the State Police data infrastructure. Plan for the removal of the wireless modems from the patrol vehicles. Coordinate the mobile data transmissions using the upgraded radios. Verify converted systems effective operation. Update the technical mobile data procurement documentation. Prepare documentation to obtain and install 1000 MCTs. Inventory, oversee the MCT installation into the VSP patrol vehicles. Verify the testing of the additional 1000 mobile computer terminals. Develop an inter/intra agency data intranet using the microwave network.	$898,929

ATTACHMENT B
To
MODIFICATION # 2
To VA-000100-HSMM

Task	Fee
K. Perform acceptance testing on all deliverables. Create and implement inventory control and configuration management. Program the new equipment with the channel plan and/or talk groups. Implement the new channel plan. Provide operator train-the-trainer training. Ensure RF safety compliance. Edit the RF radiation Compliance Plan.	$2,653,482
L. Maintain the project schedule and budget. Submit monthly reports and attend monthly meetings.	$2,123,741
M. Document the as-built design, infrastructure, network, systems, subsystems, software, firmware, and equipment.	$404,390
Q. Provide temporary/permanent offices in the Richmond area.	$833,209
R. Vendor/Commonwealth Interface	$117,165
GRAND TOTAL FOR ALL WORK	$20,067,361
K. Project Specific Insurance	$295,000
P. Costs to interview FLEWUG, and create shared network operations, if proposed.	$109,207
Modification # 2 fees: Conceptual work plan, modification of contract test and contract costing.	$58,551

Revised Contract Grand Total: **$20,530,119**
(0.286% increase)

MODIFICATION #1
TO
CONTRACT #90511-00
BETWEEN
THE COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC.

This MODIFICATION #1 is an agreement between the Commonwealth of Virginia, hereinafter referred to as "State" or "Commonwealth" or "DIT" (Department of Information Technology), and Hayes Seay, Mattern & Mattern, Incorporated, hereinafter referred to as "Contractor" relating to Contract 90511-00, dated June 30, 2000, as amended, hereinafter referred to as the "Contract" or "Agreement". This modification #1 is hereby incorporated into and made an integral part of the Agreement.

The purpose of this Modification #1 is to document the change of procurement authority within the Commonwealth of Virginia for this Contract from the Department of General Services, Division of Purchases and Supply to the Department of Information Technology, Acquisition Services Division.

Both parties agree to the following.

1. At the execution of this Modification #1, the above referenced Contract, as identified by #90511-00, shall be changed to #VA-000100-HSMM. Henceforth, all correspondence, and all references made to the above referenced Contract hereafter, shall use the identifier, #VA-000100-HSMM.

2. At the execution of this Modification #1, the only representative authorized to amend any Contract terms and conditions for the Commonwealth, in addition to the Contracts Manager, DIT, shall be the party as identified below. All notices, communications and Contract correspondence shall be sent to the individual as noted, until amended by the Contracts Manager, DIT:

Robert E. Gleason, Telecommunication Contracts Engineer, DIT
110 S. 7th Street, East Lobby Level
Richmond, VA 23219
Phone: 804-371-5900, Fax: 804-371-5969,
Email: rgleason@dit.state.va.us

The foregoing is the complete and final expression of the parties' agreement to modify Contract VA-000100-HSMM and cannot be modified, except by a writing signed by duly authorized representatives of both parties.

ALL OTHER TERMS AND CONDITIONS REMAIN UNCHANGED.

PERSONS SIGNING THIS CONTRACT ARE AUTHORIZED REPRESENTATIVES OF EACH PARTY TO THIS CONTRACT AND ACKNOWLEDGE THAT EACH PARTY AGREES TO BE BOUND BY THE TERMS AND CONDITIONS OF THE CONTRACT.

HSM&M INCORPORATED

BY: William G. Porter

NAME: William G. Porter

TITLE: Senior Vice President

DATE: 31 Oct 00

COMMONWEALTH OF VIRGINIA

BY: Robert E. Gleason

NAME: Robert E. Gleason

TITLE: Telecommunications Contracts Engineer

DATE: 10/6/2000

REVIEW AND APPROVAL
VIRGINIA STATE POLICE

BY: W. Gerald Massengill

NAME: W. Gerald Massengill, COL

TITLE: Superintendent

DATE: 10-10-00

COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT

Contract# 90511-00

This contract entered into this 30th day of June, 2000 by Hayes, Seay, Mattern & Mattern, Inc., hereinafter called the "Contractor", the Commonwealth of Virginia, Virginia Department of State Police, hereinafter called the "Purchasing Agency"; and the Commonwealth of Virginia, Division of Purchases and Supply, hereinafter called the "Issuing Agency".

WITNESSETH that the Contractor and the Purchasing Agency, in consideration of the mutual covenants, promises and agreements herein contained, agree as follows:

SCOPE OF CONTRACT: The Contractor shall provide the services to the Purchasing Agency as set forth in the Contract Documents.

PERIOD OF PERFORMANCE: From July 1, 2000 through October 1, 2006.

The contract documents shall consist of:

(1) This signed form, and
(2) The attached negotiated contract #90511-00 (resulting from Request for Proposals #90511-00JW) consists of: Table of Contents; Scope of Contract; General Terms and Conditions; Special Terms and Conditions; and four Attachments (Attachment A- Scope of Services, Attachment B – Basis of Schedule of HSMM Fees, Attachment C – Schedule of Fees/Additional Services, and Attachment D – Equipment List), all of which documents are incorporated herein.

IN WITNESS WHERE OF, the parties have caused this Contract to be duly executed intending to bound thereby.

CONTRACTOR:
Hayes, Seay, Mattern, & Mattern, Inc.

By: _____
William G. Porter
Senior Vice President

Date: 30 JUN 00

PURCHASING AGENCY
Virginia Department of State Police

By: _____
Colonel W. Gerald Massengill
Superintendent

Date: 6/30/00

ISSUING AGENCY
Virginia Division of Purchases and Supply

By: _____
Judith C. Wallace
State Procurement Specialist Sr.

Date: 6/30/00

CONTRACT # 90511-00
BETWEEN
THE COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC.

CONTRACT # 90511-00
BETWEEN
THE COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC

TABLE OF CONTENTS

SECTION IV. ATTACHMENTS

CONTRACT # 90511-00
BETWEEN
THE COMMONWEALTH OF VIRGINIA
AND
HAYES, SEAY, MATTERN & MATTERN, INC.

SECTION I. SCOPE OF CONTRACT

A. INTRODUCTION

This is a Contract (the "Contract") dated July 1, 2000 (the “effective date”), between the Commonwealth of Virginia (hereinafter referred to as the "Commonwealth or "State") and Hayes, Seay, Mattern & Mattern, Inc. (hereinafter referred to as "HSMM" or "the Contractor"), for the furnishing of all labor, supervision, travel, materials, and other expenses to research, design, prepare technical documentation for and evaluate responses to solicitations, manage the installation, assist in project administration, ensure quality, and implement an upgrade to the State Police Land Mobile Radio (LMR) and Microwave Networks during the period July 1, 2000, through October 1, 2006.

B. BACKGROUND

The Virginia State Police (VSP) presently owns and operates a state-wide VHF high-band Land Mobile Radio (LMR) network and a 2 GHz and 6 GHz microwave network. Approximately 90 percent of the Commonwealth is provided mobile radio coverage by the operation of 45 LMR sites and 84 microwave sites. Portable radios are used through the use of vehicular repeaters. The state is divided into seven divisions with each division further divided into two zones for radio communications. The LMR network was originally installed in 1977 and has since been constantly improved to provide state-wide radio coverage and operational effectiveness. Each division is responsible for dispatching and coordinating the radio communications within its area of responsibility. The majority of the State Police land mobile radios are approximately 20 years old. This equipment must be replaced to ensure communications are maintained.

The present conventional four channel network supports approximately 3,235 users (2,375 VSP personnel and 860 other Federal, State, and Local users). Communications are maintained by reusing the channels four times throughout the state and using an aural brevity code to minimize air time. The frequency reuse strategy prevents wide area radio coverage of a channel. The large number of users prevents the addition of mobile data radio traffic. Therefore, the VSP must lease commercial telecommunications services to transmit mobile data. This is not preferred due to the high cost of air-time.

The VSP microwave system consists of 84 hops of 6 GHz digital, 2 GHz analog, and 900 MHz analog radios. The hub of the microwave network is at the State Police Headquarters in Richmond. There are four main microwave circuits which originate at this location, and are

called the East, North, Northeast, and West circuits. The 6 GHz DS3 digital backbone radios consist of 17 hops. Four (4) of the seven (7) Division headquarters are served by the digital backbone. The remaining Division headquarters are served by 2 GHz analog microwave radio networks. The channel capacity of these radios is 36 or 48 channels. All analog microwave radios which carry LMR radio traffic have hot-standby backup radios, with the exception of four hops on the East circuit. VSP has 45 LMR base station sites, 13 of which are fed with digital microwave, and the remaining fed with analog microwave radio.

Virginia's public safety organizations (as defined by the Federal Communications Commission) operate separate private LMR networks to support their operations. It has been decided that since the VSP must replace its current equipment, that a shared LMR network should be used due to the need for mutual communications. In addition, radio frequency resources and the infrastructure cost can be shared. It is highly desired that the existing VSP radio networks (LMR and microwave) serve as the basis for an upgrade. They are mature architectures that have been operationally and technically refined over the years.

C. SCOPE OF SERVICES

See Attachment A.

II. GENERAL TERMS AND CONDITIONS:

A. VENDORS MANUAL: This contract is subject to the provisions of the Commonwealth of Virginia Vendors Manual and any revisions thereto, which are hereby incorporated into this contract in their entirety. A copy of the manual is normally available for review at the purchasing office and in addition a copy can be obtained by calling the Division of Purchases and Supply (804) 786-3845.

1. Changes to these requirements after the effective date of this contract may be the basis for modifications to the Commonwealth's responsibilities or to Contractor's scope of services, times of performance and/or compensation.

B. APPLICABLE LAWS AND COURTS: This contract shall be governed in all respects by the laws of the Commonwealth of Virginia and any litigation with respect thereto shall be brought in the courts of the Commonwealth. The Contractor shall comply with all applicable federal, state and local laws, rules and regulations.

1. Changes to these requirements after the effective date of this contract may be the basis for modifications to the Commonwealth's responsibilities or to Contractor's scope of services, times of performance and/or compensation. In the event of a conflict between any such laws, rules, regulations, ordinances and codes, or Commonwealth-mandated standards, Contractor shall notify the Commonwealth of the nature and impact of such conflict. The Commonwealth agrees to cooperate and work with Contractor in an effort to resolve any such conflict.

C. ANTI-DISCRIMINATION: The Contractor certifies to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and Section 11-51 of the Virginia Public Procurement Act.

1. During the performance of this contract, the Contractor agrees as follows:

   a. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, or disabilities, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

   b. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.

   c. Notices, advertisements and solicitations placed in accordance with federal law, rules or regulation shall be deemed sufficient for the purpose of meeting these requirements.

2. The Contractor will include the provisions of item 1. above in every subcontract or purchase order over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

D. ETHICS IN PUBLIC CONTRACTING: The Contractor certifies that their proposals were made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other Offeror, supplier, manufacturer or subcontractor in connection with their proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

E. IMMIGRATION REFORM AND CONTROL ACT OF 1986: The Contractor certifies that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986.

F. DEBARMENT STATUS: The Contractor certifies that they are not currently debarred by the Commonwealth of Virginia from submitting bids or proposals on contracts for the type of goods and/or services covered by this contract, nor are they an agent of any person or entity that is currently so debarred.

G. ANTITRUST: By entering into a contract, the Contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of the action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.

H. PAYMENT:

1. To Prime Contractor:

a. Invoices shall be submitted by the Contractor directly to the payment address shown on the contract. All invoices shall show the state contract number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations).

b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however.

c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the Contractor at the contract price, regardless of which public agency is being billed.

d. The date of postmark shall be deemed to be the date of payment in all cases where payment is made by mail, or the date of offset when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act.

e. Payments shall be made monthly and, where applicable, shall be in proportion to services performed within each phase of service. Retainage in the amount of five percent shall be withheld from each progress payment within each phase of service. Upon satisfactory completion of each phase of service and acceptance by the Commonwealth, retainage shall be paid to the Contractor. Retainage shall not be cumulative throughout the term of this contract.

2. To Subcontractors:

a. A Contractor awarded a contract under this solicitation is hereby obligated:

(1) To pay the subcontractor(s) within seven (7) days of the Contractor's receipt of payment from the Commonwealth for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or

(2) To notify the agency and the subcontractor(s), in writing, of the Contractor's intention to withhold payment and the reason.

b. The Contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the Contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth.

I. PRECEDENCE OF TERMS: Paragraphs A-I of these General Terms and Conditions *and paragraph B of the Special Terms and Conditions (Availability of Funds)* shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

J. TESTING AND INSPECTION: The Commonwealth reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

K. ASSIGNMENT OF CONTRACT: A contract shall not be assignable by the Contractor in whole or in part without the written consent of the Commonwealth.

L. CHANGES TO THE CONTRACT: Changes can be made to the contract in any of the following ways:

1. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.

2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the Contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The Contractor shall comply with the notice upon receipt. The Contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods:

   a. By mutual agreement between the parties in writing; or

   b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the Contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the Contractor's records and/or to determine the correct number of units independently; or

c. By ordering the Contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The Contractor shall present the Purchasing Agency with all vouchers and records of expenses incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the Contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia Vendors Manual. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the Contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.

M. DEFAULT: In case of failure to deliver services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the Contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the Commonwealth may have.

SECTION III. SPECIAL TERMS AND CONDITIONS:

A. AUDIT: The Contractor shall retain all books, records, and other documents relative to this contract for five (5) years after final payment, or until audited by the Commonwealth of Virginia, whichever is sooner. The agency, its authorized agents, and/or State auditors shall have full access to and the right to examine any of said materials during said period.

B. AVAILABILITY OF FUNDS: It is understood and agreed between the parties herein that the agency shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

C. CANCELLATION OF CONTRACT: The purchasing agency reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 60 days written notice to the Contractor. In the event the initial contract period is for more than 12 months, the resulting contract may be terminated by either party, without penalty, after the initial 12 months of the contract period upon 60 days written notice to the other party. Any contract cancellation notice shall not relieve the Contractor of the obligation to deliver/or perform on all outstanding orders issued prior to the effective date of cancellation.

D. INSURANCE: The Contractor shall have the following insurance coverage at the time the contract is awarded. The Contractor further certifies that the Contractor and any subcontractors will maintain these insurance coverages during the entire term of the contract and that all insurance coverages will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.

INSURANCE COVERAGES AND LIMITS REQUIRED:

1. Worker's Compensation - Statutory requirements and benefits; require that the Commonwealth of Virginia be added as an additional named insured on Contractor's policy.

2. Employers Liability - $100,000.00

3. Commercial General Liability - $500,000.00 combined single limit. This coverage is to include Premises/Operations Liability, Products and Completed Operations Coverage, Independent Contractor's Liability, or Owner's and Contractor's Protective Liability and Personal Injury Liability. The Commonwealth of Virginia must be named as an additional insured when requiring a contractor to obtain Commercial General Liability coverage.

4. Automobile Liability - $500,000.00

E. PRIME CONTRACTOR RESPONSIBILITIES: The Contractor shall be responsible for completely supervising and directing the work under this contract and all subcontractors that he may utilize, using his best skill and attention. Subcontractors who perform work under this contract shall be responsible to the prime Contractor. The Contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors and of persons employed by them as he is for the acts and omissions of his own employees.

F. SUBCONTRACTS: All subcontracting must be approved by the Commonwealth. No portion of the work shall be subcontracted without prior written consent of the Commonwealth. In the event the Contractor desires to subcontract some part of the work specified herein, the Contractor shall furnish the purchasing agency the names, qualifications and experience of their proposed subcontractors. The Contractor shall, however, remain fully liable and responsible for the work to be done by its subcontractor(s) and shall assure compliance with all requirements of the contract.

G. INDEMNIFICATION: Contractor agrees to indemnify, defend and hold harmless the Commonwealth of Virginia, its officers, agents, and employees from any claims, damages and actions of any kind or nature, whether at law or in equity, arising from or caused by the use of any services of any kind or nature furnished by the Contractor, provided that such liability is not attributable to the sole negligence of the using agency

or to failure of the using agency to use the services in the manner already and permanently described by the Contractor on the services delivered.

H. ADVERTISING: The Contractor agrees that no indication of services provided to the Commonwealth of Virginia will be used in product literature or advertising without written approval from the Department of General Services.

I. OWNERSHIP OF INTELLECTUAL PROPERTY: All copyright and patent rights to all papers, reports, forms, materials, creations, or inventions initially created or developed in the performance of this contract (hereinafter collectively referred to as "Documents") shall become the sole property of the Commonwealth. On request, the Contractor shall promptly provide an acknowledgment or assignment in a tangible form satisfactory to the Commonwealth to evidence the Commonwealth's sole ownership of specifically identified intellectual property created or developed in the performance of the contract.

1. Copies of Documents that may be relied upon by the Commonwealth are limited to the printed copies (also known as hard copies) that are signed and/or sealed by HSMM or HSMM's subconsultants. Files in electronic media format of text, data, graphics or of other types that are furnished by HSMM to the Commonwealth are only for the convenience of the Commonwealth. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk.

2. Electronic files are intended to work only as specified in this Agreement. These files are compatible with Microsoft 2000 or AutoCAD Release 2000, as appropriate, operating on IBM-compatible PC's operating with Windows NT version 4, service pack 3. HSMM makes no representations as to the compatibility of these files beyond the specified release of the above-stated software.

3. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the Commonwealth agrees that it will perform acceptance tests or procedures within 60 days after receipt of such data, after which the Commonwealth shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by HSMM at no cost to the Commonwealth. However, HSMM shall not be responsible to maintain documents stored in electronic media format after acceptance by the Commonwealth.

4. When transferring documents in electronic media format, HSMM makes no representations as to long term compatibility, usability or readability of documents resulting from the use of software application packages, operating systems or computer hardware differing from those used by HSMM for this project.

5. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

6. The Commonwealth may make and retain copies of Documents for information and reference in connection with use on the project by the Commonwealth. Such Documents are not intended or represented to be suitable for reuse by the Commonwealth or others on extensions of the project or on any other project. Any such reuse or modification without written verification or adaptation by HSMM, as appropriate for the specific purpose intended, will be at the user's sole risk and without liability or legal exposure to HSMM or to HSMM's subconsultants.

7. Any verification or adaptation of the Documents by HSMM for extensions of the project or for any other project will entitle HSMM to further compensation at rates to be agreed upon by the Commonwealth and HSMM.

8. Under no circumstances shall delivery of the electronic files for use by the Commonwealth be deemed a sale by HSMM, and HSMM makes no warranties, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall HSMM be liable for any loss of profit or any consequential damages as a result of the Commonwealth's use or reuse of the electronic files.

J. INSPECTION OF JOB SITE: Contractor's signature on this contract constitutes certification that it has inspected the job site and am aware of the conditions under which the work must be accomplished. Claims, as a result of failure to inspect the job site, will not be considered by the Commonwealth.

K. CONTRACTOR AS INDEPENDENT CONTRACTOR: During the performance of this Contract, the Contractor and his/her employees shall be regarded as an independent Contractor and not as employees or agents of the Commonwealth of Virginia. The Contractor shall be responsible for all its own and its employees' insurance and federal, state, local and FICA taxes.

L. CONFIDENTIALITY AND OWNERSHIP OF WORK PRODUCT: The Contractor shall keep all data, documents, opinions and information of any kind strictly confidential and shall reveal such matters only to authorized representatives of the Commonwealth of Virginia. For the same reason, all reports, estimates, working papers, tapes, pictures, documents, data and information and materials of any kind made, collected or produced by the Contractor or provided to it by the Commonwealth of Virginia shall be turned over to the representatives of the Commonwealth upon request. The Contractor's obligations imposed by this paragraph shall survive and continue after completion of the remainder of the contract and the Contractor shall continue to be responsible for any breach.

M. FINAL INSPECTION: The Contractor shall assure that the applicable contractor(s) for all subsequent procurements for this project demonstrate to the Commonwealth's representative that the work is fully operational and in compliance with the applicable contract specifications and codes. The Contractor (consultant) will identify any apparent deficiencies that require correction.

N. DRUG FREE WORKPLACE: The Contractor acknowledges and certifies that it understands that the following acts by the Contractor, its employees, and/or agents performing services on state property are prohibited:

1. The unlawful manufacture, distribution, dispensing, possession or use of alcohol other drugs; and
2. Any impairment or incapacitation from the use of alcohol or other drugs (except the use of drugs for legitimate medical purposes).

The Contractor further acknowledges and certifies that it understands that a violation of these prohibitions constitutes a breach of contract and may result in default action being taken by the Commonwealth in addition to any criminal penalties that may result from such conduct.

O. YEAR 2000 COMPLIANT (AND ENABLEMENT) WARRANTY: The Contractor warrants that the system designed and implemented, including all software/firmware and software deliverables delivered to the Commonwealth of Virginia under any agreement as a result of this contract, shall be 4-digit Year 2000 compliant (or approved enabled). All products shall accurately process all date-change data from start to finish, including, but not limited to, twentieth, twenty-first centuries and leap year calculations.

P. ETHICS: The Contractor warrants that he has read and has fully complied with the Virginia Governmental Frauds Act (Section 18.2-498.1 et seq.), Articles 2 and 3 of Chapter 10 (Crimes Against the Administration of Justice) of Title 18.2, and Article 4 (Ethics in Public Contracting) of the Public Procurement Act (Section 11-72 et seq.). Also, the Contractor warrants that he has read the State and Local Government Conflict of Interests Act (Section 2.1-639.1 et seq. of the Code of Virginia) and understands that as he is acting in a partnering role with the Commonwealth, this portion of the Code also applies to the Contractor.

Q. PARTICIPATION IN SUBSEQUENT CONTRACTS: The Contractor shall comply to Section 11-78.1 of the Virginia Public Procurement Act which states "No person who, for compensation, prepares an invitation to bid or request for proposal for or on behalf of a public body shall (i) submit a bid or proposal for that procurement or any portion thereof or (ii) disclose to any bidder or offeror information concerning the procurement which is not available to the public. However, a public body may permit such person to submit a bid or proposal for that procurement or any portion thereof if the public body determines that the exclusion of such person would limit the number of potential qualified bidders or offerors in a manner contrary to the best interests of the public body."

R. BACKGROUND CHECK: The Contractor and/or his employees may be subject to a criminal history/background check.

S. PATENTS: The Contractor warrants that the system upgrade as designed by the Contractor hereunder shall be free of rightful claim of any third party for infringement of any United States patent or copyright.

T. CONTRACTUAL REFERENCE TO THE DESIGN PROFESSIONAL: This contract for professional services has been entered into by the Commonwealth and Hayes, Seay, Mattern & Mattern, Inc. ("HSMM"). Wherever used herein, the term "Contractor" shall mean HSMM, a Virginia corporation rendering professional architectural and engineering services. The term "Contractor" does not imply that HSMM is engaged in any aspect of the physical work of construction contracting, nor is HSMM responsible in any way for the construction means, methods, techniques or sequences nor for any aspect of jobsite safety. These duties are and shall remain the sole responsibility of the construction general contractor.

U. INTERPRETATION: Although specific provisions of this contract refer to some services with terms such as "assure," "comply with," and "ensure," such terms and similar terms shall be qualified by the standard of care for professional engineers practicing at the same time in the Commonwealth of Virginia under similar circumstances.

V. AGREEMENT TO CONTRACT CHANGES: The parties shall negotiate regarding additional changes to the contract if necessary to comply with Virginia Code § 2.1-483.1. In the event the parties do not agree on the changes required, or the required changes are unacceptable to either party, the contract as to those portions of the work hereunder which give rise to the disagreement shall be terminated without further obligation of either party.

W. UNAPPROVED WORK (OUT OF SCOPE WORK): The Contractor shall not be entitled to an increase in the contract price with respect to any services or work performed that is not required by the Contract as amended, modified, or supplemented as provided in this Paragraph L. A change in the contract price shall be accomplished only by a written change order. Accordingly, no course of conduct or dealings between the parties, no expressed or implied acceptance of extra work or services, and no claim that the Commonwealth has been unjustly enriched by any extra work or services shall be the basis of any claim for an increase in any amount due under the Contract. Correspondingly, the Contractor shall not be required to provide any services or work not required by the Contract as amended, modified, or supplemented as provided in this paragraph and Paragraph L unless and until the parties have executed an appropriate change order.

SECTION IV. ATTACHMENTS

The following attachments are hereby incorporated into this contract by reference as if fully set forth herein:

A. Scope of Services
B. Basis of Schedule of HSMM Fees
C. Schedule of Fees/Additional Services
D. Equipment List

ATTACHMENT A

SCOPE OF SERVICES

Task A

A. *The contractor shall inventory the assets (both equipment and transmitter sites) and provide a radio needs assessment for the following state organizations. This shall include growth that is expected within the next ten years. The Federal organizations currently registered on the system shall have a needs assessment performed. A list of these Federal organizations will be provided at the pre-proposal conference. The needs assessment shall include present and future data requirements, both mobile and fixed. A list of Commonwealth counties and cities that may be participating in this network will be provided to the contractor. The contractor shall visit each of the following organizations and submit a report that documents the present asset inventory and the expected growth in ten years. A needs assessment, inventory, or travel to the participating localities or Federal organizations is not anticipated.*

- *Virginia Department of State Police*
- *Virginia Department of Alcoholic Beverage Control*
- *Virginia Department of Aviation*
- *Virginia Department of Conservation and Recreation*
- *Virginia Department of Corrections*
- *Virginia Department of Emergency Services*
- *Virginia Department of Environmental Quality*
- *Virginia Department of Fire Programs*
- *Virginia Department of Forestry (Charlottesville)*
- *Virginia Department of Information Technology*
- *Virginia Department of Game and Inland Fisheries*
- *Virginia Department of Health*
- *Virginia Department of Juvenile Justice*
- *Virginia Department of Military Affairs (Fort Pickett, Blackstone))*
- *Virginia Department of Mines, Minerals, and Energy (Wise County)*
- *Virginia Department of Motor Vehicles*
- *Virginia Department of Transportation*
- *Capitol Police*
- *Marine Resources Commission (Newport News)*

The following items were agreed upon during negotiations:

*The contractor shall consider **aircraft** communications in the needs assessment and in the design. As a Division is migrated onto the system, aircraft communications shall be available to the extent that the design permits. Each agency shall have the capability to monitor site operations and system statuses. All facilities, towers, and radios shall have remote alarms to notify VSP dispatchers of intrusion alarms and VSP network operators of malfunctions. All dispatching consoles shall be capable of intercommunicating, including those from different agencies. **In-building coverage** is required in all state buildings in the capital area to the extent described herein.*

The following tunnels will require LMR coverage.

1. Big Walker Mountain Tunnel (Rt. 77)
2. Hampton Roads Tunnel (Rt. 64)
3. Elizabeth River Downtown Tunnel (Rt. 264)
4. Monitor-Merrimac Memorial Bridge-Tunnel (Rt. 664)
5. & 6. Chesapeake Bay Bridge Tunnels (2 tunnels, Rt. 13)
7. Elizabeth River Midtown Tunnel (Rt. 58/337))
8. East River Mountain Tunnel (Rt. 77)

This scope of work is based on the attached table listing subscriber units. Any change in quantities by more than 10% may result in a change order. Any changes in quantities must be agreed to prior to beginning Task G.

The following sub-tasks address the work requirements for the above RFP Task.

A. User Agency Assessment

For the purposes of this task, our efforts will be directed to and limited to the 19 Commonwealth of Virginia primary LMR system users and the Federal Government users identified in the RFP and other official correspondence provided by the Commonwealth regarding this project. The Federal Government agencies will be represented by a single contact, who will be empowered to obtain information from the agencies and to discuss their needs and current situation with HSMM. Information provided with respect to the Federal Government agencies will be consolidated, in tabular or text form, and where available will be provided in digital format.

The purpose of this assessment is to develop information necessary for the upgrade of the existing VSP system to accommodate the listed State agencies, and to provide functionality and coverage as required by the Commonwealth.

A.01 Inventory Subscriber Equipment

HSMM will meet in Richmond with representatives of 15 state agencies located there, and in the headquarters location of the remaining four agencies to determine existing subscriber unit documentation and establish inventory requirements. We will review the inventory documentation provided by the 19 state agencies. We will also develop a database that documents subscriber units for all agencies. We will then provide the inventory to state officials for review. All suggested changes will be incorporated and the subscriber unit database and supporting documentation will be finalized. The Commonwealth will be responsible for surveying any participating or potentially participating localities (cities or counties). In the event that a locality elects to participate in the system, and the Commonwealth determines that such locality is indeed a candidate for participation, HSMM will, upon direction of the Commonwealth, perform a needs assessment survey for that locality at a unit price as established in the schedule of fees under “added services”.

We note that there are two additional agencies (The Office of the Governor and Consolidated Laboratories) that will be included as part of the other 19 agencies. The needs assessments for the Office of the Governor and Consolidated Laboratories will be addressed as part of the needs assessments of the agencies that are responsible for providing radios to them.

A.02 Inventory Fixed Infrastructure

HSMM will physically inventory all fixed end infrastructure equipment for the Virginia State Police (VSP) as part of Task C. We will rely on documentation provided for the inventory of the remaining 18 state agencies. Our engineers will visit existing radio sites of non-VSP agencies only to the extent that use of these sites are contemplated as part of the overall LMR network design. At those sites we will review and spot-check drawings and data provided to confirm completeness and accuracy. We will review the inventory documentation provided by the 19 state agencies. Since none of the non-VSP agency equipment is to be re-used in the ultimate VA PS LMRN, HSMM will not log, track, or evaluate current assets. Finalized system documentation will include system capacity, routing, coverage areas, radio user operating parameters, site, tower, and building conditions, and frequencies in use to the extent provided by the agencies and our physical inventory of VSP.

We assume that the documentation provided by the agencies will be adequate and complete. Should we discover that this is not the case, we will advise the Commonwealth, and together determine a course of action.

A.03 Review of Federal Organization Needs

There will be a single point of contact for all Federal organizations, who will be empowered to act on behalf of those organizations with respect to the needs assessment. HSMM will review all responses from the point of contact for the federal agencies. This information will be included in the overall report.

A.04 Develop a 10-Year Growth Plan

HSMM will develop a 10 year growth plan addressing requirements and projections for each of the 19 State agencies identified in the RFP, and all federal agencies listed, to the extent that the information is provided to HSMM by the federal agency point of contact. Resulting information will be published by HSMM. We will depend heavily on future projections provided by the Commonwealth and the participating agencies to determine future radio growth requirements. Future radio growth will be based on projected population growth. We will review and analyze historical statistics provided by the Commonwealth.

A.05 Assess Data Requirements

As part of our review of mobile data requirements HSMM will address and review both current mobile data requirements, Intranet requirements and the future requirements as provided to us by the participating agencies.

HSMM will review mobile data requirements for each state and the federal agencies, as provided by the single point of contact. We will review all existing hardware and software as part of the interview process. We will then review the data management plan for state and department implementation.

A.06 Visit and Interview Each Agency

HSMM will visit and interview the 19 State agencies. We recognize that four of these agencies are located outside the Richmond area. We intend to visit their headquarters locations as we describe in this section. With respect to visiting the radio sites currently in use for each agency, we intend to visit each VSP radio site as described in Section C.01. We will visit other agency's sites to the extent they are included in the ultimate VPSLMRN.

We expect that each Commonwealth of Virginia agency involved in the project will appoint a representative who will act as the point of contact for that agency during the project. The Commonwealth will identify these representatives and provide a list including telephone, FAX, address, and e-mail address. This representative should be familiar with the two-way radio environment of the agency and be able to effectively coordinate between the agency and HSMM. We assume that this representative will be available upon reasonable advance notice for interviews, teleconferences, and to review documents and respond to information requests. Should this not prove to be the case, the Commonwealth will identify an alternate and provide the information to us.

Our engineers will review and augment existing system data in the records of the participating agencies. We will review existing system and operational data from the users and maintenance personnel. We will request from the Agency Representative the latest information on the present systems and operations. This will comprise details such as: lists of equipment; existing site and facility drawings; operational procedures; traffic loading; future requirements; and growth projections. The Commonwealth will ensure that this information is provided to the extent that it is available.

In advance of the first visit and interview, we will conduct an Initialization Meeting in Richmond involving the representatives of all-participating agencies and users. This meeting will outline the project objectives and methodology and solicit advice and assistance of all attendees. This meeting will introduce key Commonwealth representatives, as well as the HSMM personnel assigned. The Commonwealth will introduce the assigned Project Manager and identify the responsible Agency Representatives individuals from each department.

The Agency Representatives will schedule interviews with the users of participating agencies. It is envisioned that each agency's interviews will be scheduled as a block. With the larger agencies, the interviews should be scheduled in geographic or operational divisions with the advice of the Agency Representative. We will conduct on-site facility and operational surveys in Richmond, except for the four agencies located outside Richmond, in which case we will travel to their headquarters location.

The survey team will conduct three weeks of interviews in Richmond. We will conduct a number of personal interviews, some with individuals and some with groups. We will directly observe the Richmond area dispatch centers operations, taking notes, asking questions, and analyzing procedures. We will review the latest statistical data on calls for service and responses. We will also study applicable staffing levels, special operational requirements, fixed and rotary-wing aircraft (including military) communications, unique dispatch procedures, data,

documentation and system status requirements via an Intranet and interoperability needs. The engineers require enough operational and system requirement information to develop parameters such as:

- Channel and loading requirements
- Types and capabilities of radio units needed
- Quantities of present and future radios
- Quantities and functions of consoles
- CAD and Console capabilities and requirements
- and other system design elements

A.07 Submit Agency Reports

Upon completion of the above tasks HSMM will prepare and submit two bound copies of a draft report describing our assessment of the two-way radio communications needs of each agency. We will post the document on the Intranet. Our report will contain the baseline of each agency's current communications environment. Budget and cost estimate information will be developed in the Master Budget as part of Task L.

Commonwealth officials will review the draft report document, and provide consolidated comments to HSMM. We envision the comments will be provided to HSMM within ten working days after receipt of the report document. Upon completion of the draft review and approval of the contents, we will publish a Final Report, including a focussed executive summary directed to that agency's officials. We will provide twenty bound copies, one for each agency, plus one unbound copy. We will post the document on the Intranet.

Task B

B. *The contractor shall research and document the radio frequency authorizations for the agencies in the above paragraph and selected localities. The Commonwealth has licensed 40 VHF high-band channels that are planned to be the basis for this upgrade project to a trunked architecture. The four present State Police dispatch channels are planned to be the control channels. The contractor shall develop a channel plan that maximizes the resources available, devise a frequency reuse strategy based on the existing State Police Division boundaries, determine the capacity of the channels (considering both voice and mobile data), and if required, obtain additional channels of sufficient quantity to meet the present and anticipated requirements not met by the existing channels. The channel plan shall include all of the operational talk groups. The contractor shall design and include contingency programming for all of the subscriber equipment that will be loaded into the units for potential public safety emergencies. Users shall be able to travel throughout the Commonwealth (across Division boundaries) and be able to communicate in that Division and back to their home Division. The contractor shall consider any potential interference (both co-channel and adjacent channel) to or from existing users when developing the channel plan. The channel plan shall ensure that there is no interference to a radio whose licensee has granted concurrence to the LMR upgrade project on a non-interference basis. The contractor may consider, if required, additional radio frequency bands that are not presently in use. The contractor shall consider including localities, not previously identified, that can contribute usable radio frequencies or clear up interference. In determining a usable frequency, the contractor shall consider one that may be used in: the same radio, a mobile antenna with 3 dB of gain, and the same duplexer or transmitter combiner network. The channel plan shall at least consider the implementation of FDMA, TDMA, and Linear Modulation. The channel plan shall consider loading issues for both voice and data. (No travel requirements are expected for this task.)*

The following items were agreed upon during negotiations:

All Talk Groups identified for use on the system shall be developed by the contractor including each subscriber ID, not just templates

The channel plan shall consider loading issues for both voice and data. The channel plan shall consider both private individual agency communications and joint interagency communications. The channel plan's contingency programming shall consider reassigning the appropriate priorities to specific agencies or talk groups based upon the communications scenario it was designed to facilitate, as that scenario is identified by the agencies in the "needs assessment" task. (No travel requirements are expected for this task.)

The contractor shall attempt to obtain frequencies if more are needed. This includes identification, engineering, application preparation, and follow-up resulting in licensed usable frequencies to the extent described herein.

The following sub-tasks address the work requirements for the above RFP Task.

B. Channel and Talk Group Planning

The tasks in this section cover the aspects of radio frequency channel planning and radio user talk group planning.

Radio channel planning is covered in Task B-1 and deals with the technical aspects of radio frequency allocation, spectrum analysis and interference. Development of a VHF radio channel plan is a highly technical and complex process, given the propagation and interference characteristics of the frequency band, and the band configuration as set up by the FCC. For this reason, we will utilize an advanced computer model (VFAM) to establish and update the frequency plan. This is described in Task B-1.

Talk group planning is covered in Task B-2 and deals with the operational aspects of user talk groups, ID assignment and fleet mapping. Talk group identification and fleet mapping are dependent on the operational use to which the radio system is to be put. The design aspect is not particularly complex, however it does require careful record keeping and tracking. What is important, however, is the process of establishing talk groups such that the fleet map is effective, easily used by field personnel, and does not encourage frivolous use of the system. This process is one of education and guidance. We have described in B-2 both of these concerns.

THE FOLLOWING SECTION IS PROPRIETARY:

B1. Spectrum Analysis – Channel Plan (Proprietary)

B1.01 Channel Plan Development (Proprietary)

B1.02 Channel Plan Submittal (Proprietary)

THIS ENDS THE PROPRIETARY SECTION.

B2. Talk-Group Plan

Through the use of VFAM, HSMM will determine the capacity of the channels with each pass. Part of the process of establishing the capacity of the system is to take into consideration the operational characteristics of each of the agencies. This includes consideration of the loading characteristics for each of the agencies, the way they use

their radios, the way that they travel throughout their own operational area as well as how they roam from one operational area to another. These factors are inputs to the Capacity Analysis Module of VFAM, and were described in Task B1 of this scope of work.

Talk group designation or fleetmapping is a second aspect of the channel plan. This is separate from the VFAM analysis. The number and makeup of talkgroups also takes into consideration such factors as interoperability, contingency planning, and ease and straightforwardness of operation for the users.

The result of the frequency selection process, therefore, will be a frequency plan that provides the capacity to support all users at the operational loads to which they are accustomed (or projected), provides coverage and eliminates interference from that system, and reuses frequencies and equipment to the greatest extent practical. The end result of the fleetmapping process is to provide an operational environment that is straightforward, easily understood by the users, addresses the routine and the emergency needs of the agencies, from the perspective of the agency operating alone and also from the perspective of the agency operating along with other agencies in a multi-agency activity. This will require substantial interface with the user agencies, involving education, guidance, and review of the plan on a regular basis.

HSMM will provide spectrum services to document and develop a Talk-group and ID plan that will define the communications requirements for all agencies participating on the VPSLMRN. These services include the documentation of the existing talk-group-structure. An analysis of the current operating requirements for each agency will be recorded. New voice and data requirements and radio user ID requirements of the existing Commonwealth agencies will be merged with the communications requirements of new participating agencies.

These tasks include the development and delivery of the Talk-group Plan (down to the radio user ID level), to support the voice and data communications needs of the VPSLMRN radio-user community.

B2.01 Talk-Group Plan Development

As a result of the VFAM findings, the channel plan report, and the results from needs assessment interviews with Commonwealth participants (refer to Task A.06), talk-group and radio user ID requirements will be obtained, documented, analyzed and refined by HSMM. A preliminary Talk-group Plan down to the radio user ID level will be defined based on the present and future voice and data operational parameters of the radio user community participating on the Commonwealth system.

The Talk group plan will be flexible and be designed to accept expansion, additions and updates. The Talk-group Plan will take into account special emergency response scenarios and contingency programming (dynamic regrouping). The Talk-group Plan will include identified participants who have been interviewed for this purpose. The Talk group Plan will also document and assign appropriate priorities levels for voice and data groups. Data groups will always be delayed when in contention with voice groups.

HSMM will provide two copies of the preliminary Talkgroup Plan developed under active user participation, in draft format to the Virginia Project Manager for review. We will hold a meeting with the Virginia Project Manager to explain the Talkgroup structure and its ability to support the radio users participating on the Commonwealth radio system. After this meeting, copies of the preliminary Talkgroup Plan will be send to key representatives for their review and comment. We will provide 20 bound copies of this plan, plus one unbound copy, one for each state agency identified in the RFP and one copy for FLEWUG. We will post the document on the Intranet.

Responses to the preliminary Talkgroup Plan will be collected and analyzed by HSMM. Pertinent revisions shall be incorporated into the Talkgroup Plan.

B2.02 Talk-Group Plan Submittal

The Virginia Project Manager will collect all feedback of the preliminary Talkgroup Plan from the designated agency representatives. This information will be assimilated and forwarded by the Project Manager to HSMM.

As a result of the review cycle of the draft preliminary Talk Group Plan, HSMM will incorporate pertinent revisions in order to finalize the Talkgroup Plan. The report will be assembled and organized to display the communications parameters for all agencies participating on the Commonwealth system. The final Talkgroup Plan will be published by HSMM and 20 bound copies plus one unbound copy of the report will be sent to the Virginia Project Manager for distribution to the designated agency representatives. We will post the document on the Intranet.

HSMM recognizes that talk group requirements will change during the course of the project. HSMM will work with the Commonwealth and update Talk Group and ID assignments as required as conditions change during project implementation. This is further addressed in more detail in Task K1.06.

Task C

C. The contractor shall evaluate and document the Virginia State Police's current radio infrastructure resources. The contractor shall visit each of the State Police transmitter sites (both LMR and microwave). This analysis shall include at a minimum the transmitter sites, towers and transmitter buildings. Structural information shall be provided for each resource to include condition, dimensions, power sources, HVAC capacity, fire protection, accessibility, site directions, and tower loading based on previous documentation. The contractor shall submit a report that documents the findings. The contractor shall take pictures to document each site with a digital camera and provide them to the State Police Communications Division in a digital format.

The following sub-tasks address the work requirements for the above RFP Task.

C. Virginia State Police Infrastructure Evaluation

HSMM will investigate the VSP infrastructure in depth, generally documenting the radio sites, the radio equipment, and the condition of each. Documentation will be sufficient to identify facilities capacity (space, HVAC, main and backup power, etc.) and to estimate the condition of the facilities and equipment. This will include certain sketches, dimensions critical to the installation of specific equipments, non-dimensioned floor plans, antenna location diagrams, and other information as deemed necessary by HSMM to adequately describe site conditions for purposes of developing solicitations. Provision of dimensioned drawings, complete as-built documentation, and equipment interconnect drawings may be provided at the option of the Commonwealth and as additional scope.

The information from Task C will be used to determine what equipment and facilities are capable of being re-used in Task G, design. The tower evaluation that is part of this task is intended to provide a general order-of-magnitude estimate of tower capabilities. Task I includes actual tower structural analysis, which may or may not be done concurrently with this task.

We base our scope on the documentation provided at the pre-proposal conference, which shows 87 microwave sites, 45 of which are LMR sites. We have provided for revisits to a maximum of 20% of these sites to account for access problems or obtaining additional information that might have been unavailable at the time of the first visit. Additional sites may be identified during the course of the investigation. These additional sites are not contained in this scope of work. Such additional sites will be subject to appropriate renegotiation of fee and possible schedule modifications.

Nevertheless, we expect, as part of this task, VSP will endeavor to provide the right people, and to establish permission from the right agencies, and to carry with them keys or other access tools necessary to inspect the sites so that the information may be gathered on the first visit.

We also expect, as part of this task, VSP will schedule this assistance in coordination with the overall site visit schedule, which will be set up to provide reasonable and efficient logistics.

To obtain information for Console and Computer Aided Dispatch requirements of Task D, we will be investigating these items as part of this initial survey. We will expect that the VSP will make their dispatch centers available as part of this schedule, with the necessary personnel available for interview and to demonstrate the equipment. For the purpose of this project these dispatch centers are located at divisional headquarters. Travel to Area Offices not part of the microwave network is not part of this scope of work.

C.01 Visit Each Virginia State Police LMR Site

HSMM will finalize a work-plan and schedule for surveying the VSP's 45 land mobile radio sites. We note that according to the information provided at the pre-proposal conference, all of the LMR sites are co-located with microwave sites. The work-plan will involve developing a list of and acquiring the materials and equipment needed to conduct the site surveys, developing a template that lists the categories of information the survey teams are to gather at the sites and allocating the resources needed to conduct the surveys.

HSMM will coordinate with the VSP to plan the surveys of the 45 land mobile radio sites. VSP technical or maintenance personnel are expected to be available during the surveys to answer technical questions about the site.

During the site surveys, HSMM will visit each site to determine if the following information is generally in conformance with previous documentation provided by the VSP. The VSP provided information will be developed into a database including notes indicating general conformance or non-conformance on a site-by-site basis. HSMM expects that VSP will provide available information in the following areas. HSMM will investigate the accuracy of that information and assess the condition of the following equipment and physical facilities:

- The existing communications and site equipment.
- The condition of the communications equipment and antenna systems and their installation.
- The tower and antenna installations on the tower to see if they match the current FAA and FCC licenses held by VSP.
- The tower latitude and longitude coordinates as identified by a GPS receiver.
- The building floor plan.
- How the equipment at the site interconnects with the VSP communications network.

- The site power and backup power systems.

- The condition of the building and site facilities (HVAC, fire suppression systems, access road, etc.) and develop or update a site sketch showing general locations of major items, and opportunities for location of additional equipment.

- The existing condition of the tower. (We note that the tower condition will be analyzed in detail as part of Task I. Assessment of the tower as part of Task C is of a general nature only.)

We will also make a reasonable effort to identify the characteristics of other radio tenants either on site or nearby. This information is needed to establish interference characteristics of the site. We note that some of the sites on the VSP network have a large number of tenants, or are part of tower complexes where multiple towers are located on the same mountaintop. If we identify situations where either tenant information is not forthcoming, or tenant identification is not reasonably evident, we will alert the Commonwealth project manager of that fact, and will mutually develop a course of action to obtain the needed information. We will not make any RF measurements during this investigation.

C.02 Visit Each Virginia State Police Microwave Site

HSMM will review the FCC, FAA, and site documentation currently available from the VSP.

HSMM will finalize a work-plan and schedule for surveying the VSP's 87 microwave sites. The work-plan will involve developing a list of and acquiring the materials and equipment needed to conduct the site surveys, developing a template that lists the categories of information the survey teams are to gather at the sites and allocating the resources needed to conduct the surveys.

HSMM will coordinate with the VSP to plan the surveys of the 87 microwave sites. VSP technical or maintenance personnel are required to be available during the surveys to answer technical questions about the site.

During the site surveys, HSMM will visit each site to determine if the following information is generally in conformance with previous documentation provided by the VSP. This information will be developed into a database including notes indicating general conformance or non-conformance on a site-by-site basis. HSMM expects that VSP will provide available information in the following areas. HSMM will investigate the accuracy of that information and assess the condition of the following equipment and physical facilities:

- The existing microwave and site equipment.
- The condition of microwave radio equipment and antenna systems and their installation.
- The tower and antenna installations on the tower to see if they match the current FAA and FCC licenses held by VSP.

- The building floor plan.
- The microwave equipment at the site interconnects with the VSP communications network.
- The site power and backup power systems.
- The site grounding and surge protection systems.
- The condition of the building and site facilities (HVAC, fire suppression systems, access road, etc.) and develop or update a site sketch showing general locations of major items, and opportunities for location of additional equipment.
- The existing condition of the tower. (We note that the tower condition will be analyzed in detail as part of Task I. Assessment of the tower as part of Task C is of a general nature only.)

C.03 Document Each Site

HSMM will develop and manage a database for the site information and pictures gathered at the land mobile radio and microwave sites. We will post the information on the Intranet.

C.04 Evaluate Virginia State Police Infrastructure Resources

HSMM will review the existing microwave path analysis to research design options. HSMM will also evaluate the microwave and LMR station equipment.

HSMM will make a pre-structural review for existing towers and evaluate existing site facilities. The structural analysis will be part of Task I.

C.05 Submit Infrastructure Evaluation Report

HSMM will distribute two copies of a draft report that documents the condition of the land mobile radio sites and microwave radio sites. We will meet with the VSP to review the draft report. We will include the modifications requested by the VSP and issue 8 bound copies plus one unbound copy of the final report. We will post the document on the Intranet.

C.06 Photograph Each Site

HSMM will take digital photographs of the sites. We will create an image management database to keep track of the site pictures. We will post the images on the Intranet. No hard copies are required by the Commonwealth.

C.101 Dispatch Center Surveys

Concurrent with the survey effort, HSMM will conduct site surveys of each of the 7 Division Headquarters and the Training Academy dispatch facilities. HSMM will coordinate with VSP to plan the surveys of the dispatch centers.
VSP technical and operational (dispatch and management) personnel are required to be available during the surveys to answer questions about the dispatch centers and to demonstrate operations of the consoles and the CAD.

HSMM will schedule and assign personnel to perform the surveys of the dispatch centers. The engineering data will be assembled into a database that will be created and managed by HSMM. HSMM will incorporate the survey data into an engineering inventory report, and use the information to establish the impact of the various technologies studied in Task D on the consoles and CAD.

Task D

D. *The contractor shall provide a report that documents an assessment of the available microwave and LMR technologies that are suitable for the Commonwealth to upgrade as a state wide shared public safety wireless network. The assessment shall include Trans-European Trunked Radio (TETRA), Project 25, TDMA (Ericsson), OpenSky (Amp Wireless), and Linear Modulation (Intek). Conventional, trunked network, and simulcast architectures shall also be assessed. The contractor's study shall be independent of manufacturer and technology. The contractor shall also evaluate the impact on the VSP Computer Aided Dispatch system and VSP radio consoles. The Commonwealth will review the assessment to determine minimum features and requirements for the LMR upgrade design. The contractor shall conduct a performance test of the leading mobile radio technologies to verify the manufacturers' claims*

The following items were agreed upon during negotiations:

The contractor shall conduct a performance test of the leading mobile radio technologies to verify the manufacturers' claims as described herein.

The following sub-tasks address the work requirements for the above RFP Task:

D.01 Technologies Assessment Initialization

HSMM will initiate the required LMR technologies investigations by completing a comprehensive investigation work plan for each LMR technology. We will review the technology investigation plans with the Commonwealth and conduct an initialization/kickoff meeting with appropriate Commonwealth personnel to start the investigation process.

D.02-D.06 Research LMR Technologies

HSMM engineers will research the Trans-European Trunked Radio (TETRA), APCO Project 25, TDMA (or F-TDMA), Linear Modulation, and OpenSky technologies. HSMM will perform a background search for each technology (via the Internet, technical libraries, subject matter white papers, etc.) and initiate dialog and meetings with each of the various technology vendors. Performance test plans will be developed, and the appropriate test equipment suitable for each technology will be obtained. We are only aware of Motorola as the sole supplier of APCO Project 25, Intek as the sole supplier of Linear Modulation, Ericsson as the sole proponent of TDMA (and their F-TDMA technology), and Amp Wireless as the sole supplier of OpenSky. To our knowledge, Motorola is the only US company that is actively involved in supplying TETRA equipment. System performance data and research results will be reviewed, analyzed and recorded.

We intend to perform propagation testing at the VSPHQ tower in Richmond (The "Test Bed Site"), for the purpose of comparison testing of the technologies to establish their potential suitability of the technology for use in this system.

General Process Description: Comparison testing of the five technologies

We will measure both the signal level and understandability (DAQ) for each technology, and will compare these with the Baseline Test System. This will entail installation of equipment for each of the technologies at the Test Bed Site in turn, and making both absolute and comparative measurements against the Baseline Test System. Equipment for each of the five technologies will be obtained by the Commonwealth and installed by the Commonwealth at the VSPHQ tower in Richmond as the Test Bed Site. The technologies will be tested by HSMM in turn, while the Baseline Test System will be operational throughout the process. Since these measurements are necessarily done sequentially, we expect significant variations in signal over time due to differing weather, seasonal, and atmospheric conditions. Therefore the comparison test between each technology and the Baseline Test System must be done in real time, and we provide for that in our schedule and our process.

The specific process we intend to use in the comparison testing effort will include the following:

- Based on the research results on the various technologies listed above and discussions with their manufacturers, the Commonwealth and HSMM will agree which of these vendors has a VHF product appropriate for test in the "Baseline test setup". This scope of work is based on three technologies being available for testing.

The Commonwealth will obtain a test system from each of three vendors, and will install that test system at the Test Bed Site.

- For each of the three technologies HSMM will duplicate the Baseline system test, make both absolute and comparison tests on both the Baseline System and the technology specific system (including both signal level and DAQ), and then provide a comparison analysis to the Baseline system.

- The vendor will be tasked to provide vehicular repeaters to be used in the test.

Because these tests utilize a common test site and antenna system they must be performed in series. This may cause the project schedule to increase accordingly. These tests will encompass the extent of the testing of each technology. We will document features and functionality differences to the extent that they are apparent in the technology specific system.

This program will provide valuable insight into the necessary signal levels for system design for each technology. We note that because this is a propagation test, some of the design considerations necessary for the specific technology may not be apparent in

a test of this nature, and only a truly operational wide-area test may provide the engineering data necessary for actual system design.

We believe that there will be some engineering design factors in this system that will become evident after a system is operational in a wide-area configuration, and using frequencies that are not all exclusively assigned to the State. (exclusive use frequencies). We believe that at least some of these design factors will be due to sporatic interference from distant sources, and the effect may be to require increased signal levels or to modify digital handshake protocols. It is for this reason that we recommend the first system be carefully tested under operational conditions (pilot system) while there is still time to modify later systems with information obtained from that test.

D.07 Research Microwave Technologies

HSMM engineers will research available microwave technologies, in conjunction with the microwave assessment data collected during the VSP microwave system survey (refer to Task- C). HSMM will investigate new technology options for the upgrade of the current VSP microwave system. HSMM engineers will also analyze the various options for compatibility with the various LMR technologies under evaluation in Tasks D.02 through D.06 above.

D.08 Commonwealth Review

HSMM engineers will compile and assemble all initial data, research results and other pertinent information for an interim review with the Commonwealth. Eight copies of the presentation material will be supplied by HSMM at the meeting. We will post the material on the Intranet. Commonwealth officials will review the data and research results, and provide consolidated comments to HSMM. We envision the comments will be provided to HSMM within ten working days after the technical review meeting.

D.09 Evaluate Technologies with respect to Architecture

After the LMR and microwave technologies investigations and the interim technical review with the Commonwealth are completed, HSMM engineers will perform an Impact Analysis in order to assess the relative applicability of the LMR and microwave technology applications to a state-wide VHF trunked radio system serving a large number of public safety agencies and departments.

Our Impact Analysis process is a decision-making procedure that takes into account the relative importance of a number of operational concerns, and integrates the operational assessment with the ability of particular technologies to fulfill the operational criteria. Our rigorous treatment of these elements allows us to establish a numerical ranking order for various technologies in an impartial but well substantiated manner. The value to the Commonwealth is that the process relies on the ranking of operational criteria by Commonwealth agencies, as well as the ranking of technical criteria by HSMM. The objective is for the results to be viewed by decision-makers

as well founded and impartial. Performance trade-offs, technology viability, costs, availability, etc. will be addressed. HSMM will compare the technologies specified for evaluation in the project RFP to the standard trunking and simulcast technologies available today. We will consider and assess conventional, trunked, and simulcast technologies. Conventional two-way radio system operation is included in our investigation and design.

After review of the results with the Commonwealth, and based on the performance level agreed to with the Commonwealth, we will finalize and document our Impact Analysis. We will develop a preliminary concept design to this performance level (to include LMR, Microwave, Intranet, and Mobile Data).

HSMM will, as part of the technologies analysis, review private financing options including leasing, as those options are reasonably identified.

D.10 Evaluate VSP Computer-Aided Dispatch (CAD) and Radio Consoles

During Task C, HSMM engineers will identify and review the VSP CAD and the radio consoles. As part of this task, we will identify the impact of the new LMR and microwave technologies on the VSP CAD and radio console systems, and will consider these dispatch facilities in our preliminary design. We will focus on re-use and integration of existing dispatch facilities with the upgraded VPSLMRN system.

D.11 Technology Report

Upon completion of the above tasks, HSMM will prepare and submit to the Commonwealth two bound copies of a draft report describing our assessment of the LMR and microwave technologies. Our results, and the draft report will be the basis of a review meeting in Richmond, where we will discuss our results and recommendations and work with the Commonwealth to determine an appropriate way to present those results to Commonwealth officials.

The Commonwealth will review the draft report document, and provide consolidated comments to HSMM. We envision the comments will be provided to HSMM within ten working days after receipt of the draft report document. Upon completion of the draft review and approval of the contents, we will publish a Final Technology Report with a focused executive summary. We will provide eight bound report copies, and one unbound copy. We will post the document on the Intranet.

We will prepare an executive summary and presentation material for a formal LMR Technologies presentation to Commonwealth executives.

D.101 VHF Trunking Technology Assessment

HSMM will analyze the Virginia Tech Report and review the current trunking technologies that are available. HSMM will initiate dialog with the current LMR trunking vendors (Motorola, Ericsson and E.F. Johnson). HSMM will then schedule

a visit to one operational VHF trunked system to assess its operation and functionality and to conduct tests, measurements and collect performance data. System test data and investigation results will be reviewed, analyzed and recorded by HSMM. A letter report summarizing the investigation will be submitted to the Commonwealth, followed up with a technical review meeting at which time the report findings can be discussed. We will deliver one copy of the report and also post it on the Intranet.

Task E

E. The contractor shall design and generate the technical procurement documentation for the facility to house the common control and processing hardware and administrative support staff and to upgrade an existing facility as a separate/alternative site. The upgraded facility shall house the back-up subsystem and will be made operational first for the Division 1 implementation. When the new facility is completed, primary operation shall be transferred there. The Contractor shall be responsible for the successful transfer of network operation to the new facility.

The following items were agreed upon during negotiations:

The above paragraph is modified to reflect the following:

Complete architectural and engineering design services are not to be provided under this contract. The Commonwealth will determine the appropriate procedure for procuring the construction for the new building and the renovation of the existing (whether through capital outlay procedures, non-capital outlay procedures, or design-build) and will procure such services. The consultant shall provide design specifications for the communications aspects of the buildings to the Commonwealth for use in purchasing the construction services and shall discuss the specifications with the Commonwealth and possibly an architect-engineering firm that would be selected by a separate solicitation. The communications aspects of the building shall include all the requirements of the communications area of the building. This includes such functions as console operations, network computers, office space, emergency power, etc. This requirement includes both the primary and backup facilities.

The following sub-tasks address the work requirements for the above RFP Task.

E. Network Control Site (Prime Site) Development

This entails design of a new facility and upgrade of an existing prime site facility. We term these two aspects of Task E as Tasks E1 and E2 respectively. Our preliminary schedule for installation of prime site radio equipment is, according to the schedule contained herein, in the second quarter of 2002. Our preliminary estimate for the size of this building is approximately 12,500 to 17,500 square feet of which approximately 3,000 to 5,000 square feet would be dedicated to communications equipment. This is an intuitive estimate based on similar facilities with which we have been involved in the past. We do not know the number of people the Commonwealth desires to occupy the facility and a technology for the radio system has not been selected. HSMM is responsible for preparing technical specifications for the electronic equipment room. This includes determination of size of the equipment room, functional floor plan, definition of service clearances, heat loads, power loads, and functional description of emergency power, fire detection and prevention systems, security systems and general

description of the space to include such items as overhead cable racks, raised floor, etc.

1. HSMM understands that the design and construction of prime site and upgrade (renovation) of an existing facility as a backup to the prime site will be procured under a separate solicitation.

2. If the project proceeds under a traditional Design – Bid – Build approach, under Commonwealth of Virginia Capital Outlay Procedures, HSMM estimates that the selection of the Architect-Engineer, preparation of complete contract documents, and the construction time will be on the order of 18 to 24 months for the new building. The schedule for the renovation of the existing building is dependent on the amount of renovation that is required. This could extend the date of completion of building construction beyond the estimated date of installation of radio equipment.

3. Our approach will be to prepare technical design specifications for housing the prime site electronics in the upgraded facility, with the intent that it will be made operational first for the implementation of the first phase. This plan is shown in Schedule Block 15000. We will first prepare technical design specifications to upgrade an existing facility. This will be done in the shortest reasonable time. After the existing facility is upgraded, network control will be installed in that facility. Building the new facility will likely take a longer period of time. When the new building is complete the prime site network control function will be transferred there. The new facility will house the new statewide system network control equipment. The upgraded existing facility will remain the backup network control site. It is important that the A-E that is responsible for preparation of contract documents be aware of the critical need for expeditious preparation of the design documents.

E1.01 Prime Site Criteria Development Process (New Facility)

Hayes, Seay, Mattern and Mattern will determine the communications equipment required for the Prime Site housed in the new building. We will prepare a narrative of performance standards and criteria for the Prime Site that will support the statewide system. In the event that it is not possible to establish firm equipment and system requirements at this point in the project, we will discuss design assumptions with the Virginia Project Manager and present a conceptual design and equipment list. These criteria will serve as the basis for design for the communications equipment area of the new building to be used by the building A-E.

HSMM will participate in the pre-proposal conference for the A-E selection to answer technical questions. HSMM will explain the distinct technical requirements for the Upgraded Facility and New Facility. Meeting Results will be recorded in minutes by HSMM.

E1.02 Prime Site Criteria Development Process (Renovation of Existing Facility)

Hayes, Seay, Mattern and Mattern will determine the communications equipment required for the Prime Site to support Phase 1. This equipment will be installed in the renovated existing facility in conjunction with the implementation of Phase 1. We anticipate that the new building will be complete in time for the implementation of Phase 2.

At that time, new equipment will be installed in the new building, and network control will be transferred to that location. The existing building and the network control equipment installed there will be retained as an active backup.

We will prepare a narrative of performance standards and criteria for the renovation of the existing building. These criteria will serve as the basis for design of the renovation for the communications equipment area of the existing building to be used by the building A-E. These criteria will be combined with the criteria for the new building from Task E1.01 for presentation to the building design A-E.

E1.03 New Facility Program of Space Needs Report

HSMM will combine the information from Tasks E1.01 and E2.01 into a single report. This report will be presented to the Building A-E for use as a basis of design of the two facilities. We will meet with the A-E to discuss the report and to answer questions. We will deliver two copies of the report and post it on the Intranet.

E1.04 New Facility Transfer of Network Operation

Concurrent with implementation of the first phase of the LMR project, network control equipment will be installed at the Prime Site in the upgraded (renovated) existing facility. During optimization and test of Phase 1, the network control equipment will be part of the test. When the new building is completed and the equipment is installed, primary operation will be transferred to the new site. The plan is contained within Schedule Blocks 15100, 15200. Cutover of the VSP to the new system will be concurrent to the transfer of network operations to the new Prime Site. The work for this subtask will be part of Task G3.

Task F

F. The contractor shall prepare a plan for the Commonwealth to migrate to this new LMR technology and continue to interoperate throughout the state through the migration period. The migration shall allow units that have not been upgraded to communicate throughout the Commonwealth. The migration plan shall consider the operation of the present vehicular repeater (Motorola PAC-RT and General Electric MASTER Executive II both with high-band detectors) and mobile data.

The following sub-tasks address the work requirements for the above RFP Task.

F. Migration Plan/Strategy

The VPSLMRN system encompasses the entire landmass (and territorial waters) of the Commonwealth of Virginia, and involves transition of 19 state agencies from their current operating situation to the new system. This transition is nearly as complex as the system, and to appear substantially seamless to the users, must be planned carefully. Not only are we concerned with regional transition, where the implementation is in phases (VSP Division driven), but we are also concerned with agency transition. The agencies have operational boundaries that probably do not coincide with those of the VSP, and therefore even though the majority of a particular agency division may be capable of the transition, the part that is outside the implemented infrastructure cannot move until the infrastructure is complete in that area. Therefore, any sites necessary to provide service to a VSP division shall be upgraded with that division.

An additional layer on this problem is the fact that some of the frequencies to be used in the system will come from these agencies. The incumbent agencies cannot relinquish these frequencies until they are able to migrate to the new system.

The migration plan may therefore have two aspects. The first would be the migration of VSP by phases, with VSP divisions moving to the new system, as each phase is complete. Some agencies may be able to migrate at this time as well. The second migration would occur after all the sites are in, and the system is up and running. This would entail migration of one or several agencies, and then integration of their frequencies into the existing sites which would increase the capacity of the system to accept more agencies, who would then release frequencies, and so on.

We therefore view the migration plan as a three-part process. The first is to develop a structure and general plan. This is done early, and encompasses the entire state. The second is to develop updates to the plan, which necessarily will occur in conjunction with the phased implementation. In succeeding sections we describe how we plan to do this.

The third part is to migrate the agencies to the system after the infrastructure is complete. This aspect is dependent on the frequency plan (which has not yet been developed), which is in turn dependent on the technology (which has not yet been selected) and the coverage design (which has not yet been accomplished). It is

therefore premature at this time to speculate about the impact that the Migration plan will have on either the schedule or the scope. We anticipate that this issue will be addressed as part of the initial migration planning effort.

The use of vehicular repeaters is an important part of a wide area radio system that is designed to provide mobile radio coverage. Vehicular repeaters are the only way to consistently obtain portable radio communications inside buildings and to the user that is on foot. We recognize vehicular repeater technology has not moved forward significantly in the past 10 to 15 years.

With respect to mobile data, we intend to include current and future mobile data requirements in the migration strategy. This means taking the 431 existing units discussed elsewhere in this scope and applying them to the new system, and also taking into account the 1000 new unit that are anticipated as part of this procurement.

Section F.02 Paragraph 1, "Inventory records of existing equipment" includes these mobile data units. The migration plan will consider operation of the present equipment: vehicular repeaters, mobile data units, as well as other non-fixed and fixed infrastructure that may be reused. This equipment must be carefully tracked - - so that the impact of the transition on current users is minimized.

F.01 Prepare Initial Migration Plan

HSMM will develop a strategic phased migration plan for both hardware migration and operational migration for the 19 identified agencies. Integral to this plan will be the participation of the Agency Representatives identified in the Needs Assessment process. We will also develop the required inter-divisional and interagency interoperability procedures. We will initially prepare a draft of the migration plan and provide two copies of the draft to the Commonwealth representatives. There will be two review meetings in Richmond to adjust and include Commonwealth comments in the draft. Twenty bound copies and one unbound copy of the final Migration Plan will then be submitted to the Commonwealth. We will post the document on the Intranet. The plan at this point is by necessity general. Specific migration instructions or "cutover" will be established as part of the implementation of each phase under Task G.

F.02 Continuing Year Migration Plans

In cooperation with the Richmond Division, and the state agency representatives, HSMM will develop new operating procedures for use on the new radio system for the Richmond Division. This will include interagency and interdivisional procedures as well. Transitional plans for use during the 'cutover' will be created for all agencies. Train the trainer training will be provided at the VSP Academy in Richmond on the new procedures and the transitional procedures. The Commonwealth will train users as required. As part of this plan HSMM will require users to sign a receipt for new equipment and disposition of the old equipment. Installation of the new fixed and subscriber equipment will be planned around the needs of the user agencies.

In cooperation with the Appomattox and Chesapeake Divisions and the Agency Representatives, HSMM will develop new operating procedures for use on the new radio system for the Appomattox and Chesapeake Divisions. This will include

interagency and interdivisional procedures as well. Transitional plans for use during the 'cutover' will be created for all agencies. As part of this plan HSMM will require users to sign a receipt for new equipment and disposition of the old equipment. Installation of the new fixed and subscriber equipment will be planned with the selected provider around the needs of the user agencies.

In cooperation with the Culpeper and Fairfax Divisions and the Agency Representatives, HSMM will develop new operating procedures for use on the new radio system for the Culpeper and Fairfax Divisions. This will include interagency and interdivisional procedures as well. Transitional plans for use during the 'cutover' will be created for all agencies. As part of this plan we will require users to sign a receipt for new equipment and disposition of the old equipment. Installation of the new fixed and subscriber equipment will be planned with the selected provider around the needs of the user agencies.

In cooperation with the Salem and Wytheville Divisions and the Agency Representatives, HSMM will develop new operating procedures for use on the new radio system for the Salem and Wytheville Divisions. This will include interagency and interdivisional procedures as well. Transitional plans for use during the 'cutover' will be created for all agencies. As part of this plan we will require users to sign a receipt for new equipment and disposition of the old equipment. Installation of the new fixed and subscriber equipment will be planned with the selected provider around the needs of the user agencies.

F.101 (Not Used)

F.102 ID Assignment

HSMM will develop an internal system identification number format. This numbering format will contain internal specific agency and divisional identifiers. The identification numbering format will be designed for application statewide and to all participating FLEWUG users. In our experience this is an important step that is often overlooked. It is important to establish an ID numbering structure in advance that will take into account future as well as present requirements. In the absence of a well-considered structure, IDs are assigned on an ad-hoc basis, which becomes confused and complicated later, with commensurate loss of effectiveness of personnel resources. Refer to Section B2 for more details on Talk-group and user ID planning.

F.103 User Evaluation Period (UEP)

For a period of 90 days after each division cutover to the new system there will be a User Evaluation process developed and overseen by HSMM. Through a process of interviews and specifically designed forms, we will obtain and collate the problems perceived by the users. These concerns will be responded to and applied to future system acceptance, migration plans, and training. We have found that this UEP process, which proactively solicits user response, is an extremely important part of user acceptance of the system.

Task G

G. The contractor shall design an upgrade to the existing State Police LMR and microwave networks that will have the capacity necessary to support the Commonwealth's projected requirements for ten years. The upgraded network shall provide at least 95 percent contour reliability and 98.3 percent area reliability for mobile radio coverage (geographically) and in the Virginia territorial seas. The contractor shall develop, plan, and document any new transmitter sites or microwave sites that are necessary to achieve the required coverage. Properties owned by the Commonwealth shall be considered first for additional transmitter sites. The contractor's design shall develop options that will increase the coverage reliability. The contractor shall consider the use of existing radio assets when it is technically possible and the equipment is of satisfactory condition and quality. The contractor shall investigate the impact on coverage when the gain of the mobile antenna is reduced from 3dB to achieve a larger bandwidth or smaller physical size. The contractor shall create the required technical procurement documentation to purchase the equipment, software, and installation for this upgrade. A vehicular repeater shall be used to provide extended portable coverage. The contractor shall include in the procurement documentation the necessary test equipment and training for the Commonwealth's technical staff to maintain and repair the hardware and software. The procurement documentation shall also include a provision for a term contract for several tiers of compatible mobile and portable radios and accessories that can be used by future users of the LMR network. The contractor's design shall facilitate independent dispatching by each of the participating agencies.

When designing the microwave network upgrade, the contractor should consider potential frequency relocations. If at that time, there is a potential relocation at a specific site, the VSP will negotiate the conditions based upon the contractor's design. The contractor shall assess whether the existing microwave network is adequate to serve the projected traffic needs and recommend expansion or replacement as appropriate.

The contractor shall submit a report which documents the designed coverage of the network and any infrastructure changes that are required to accomplish the required mobile coverage. The Commonwealth may determine that a proposed site is not necessary and that the specified coverage in a specific area is not required. However, portable radio coverage may be required in other specified areas. System coverage must adhere to agreements with the National Radio Astronomy Observatory.

The contractor shall develop a radio coverage acceptance test plan. The Offeror's proposal should describe how the test plan will consider: the static receiver threshold (Gaussian environment) the faded receiver threshold (Rayleigh environment); lognormal fading; number of tiles; number of samples per tile; size of the tiles; and voice quality in an interference limited system.

The contractor shall perform coverage mapping on the completed upgrade using Survey Technologies Incorporated Mobile Signal Analysis System with the Tile Analysis Software option (or equivalent) for 98.3 percent coverage verification purposes.

The following items were agreed upon during negotiations:

The term contract, for several tiers of compatible mobile and portable radios, shall meet the requirements of the individual agencies identified in the "needs assessment" task.

To facilitate new LMR sites and the creation of microwave backbone loops (for redundancy), 24 new microwave hops, half of which may need new sites, should be considered to the extent described herein.

No radio equipment will be ordered by the Commonwealth without the possession of the associated Radio Station Authorizations issued by the Federal Communications Commission. The contractor shall schedule the project's tasks in accordance with this requirement.

The following sub-tasks address the scope of work for the above RFP Task.

G. Communications System Design, Procurement and Implementation

Task G comprises three distinct components. The first component, which we have numbered Task G1, is the Design component. Here we take the technologies that have been selected as part of Task D, and concurrent with the frequency planning that is being done as part of Task B, we design a state-wide system for Virginia. The second component, which we have numbered Task G2, is the Procurement component. Here we convert the design into a specification, prepare the technical procurement documents for issuance by the Commonwealth, evaluate responses, recommend a course of action, and assist the Commonwealth in negotiating a contract. The third component, which we have numbered Task G3, is the Implementation component. This will be done in phases, where the first phase will be the Richmond area. This includes installation of the equipment, optimizing of the system, and acceptance testing. Coverage acceptance testing is contained in Task G3, while equipment and system acceptance testing is part of Task K.

G1. Design

G1.01 Design VPSLMR Network Upgrade

The design process cannot be done in detail until completion of Task D. Some design effort will, however, begin earlier, specifically the microwave and coverage analysis. Coverage analysis and design must be done concurrent with the frequency planning in Task B.

We will begin with an initialization meeting, which will include the Virginia Project Manager, and the Commonwealth management team, as well as all members of the HSMM team. Prior to convening the initialization meeting, we will have provided a letter describing the information people will need to be prepared to discuss at the meeting. We will document the meeting with a meeting record.

From the needs assessment information, we will determine the requirements of the 19 state agencies, operational boundaries, needs for statewide or cross divisional communications and dispatch, inter-zone roaming, aircraft (fixed-wing, rotary-wing, military) communications, and system management requirements.

From the Technologies Assessment information, we will identify reasonably achievable design parameters. We will use the current licenses as the basis for the system design, with sites added to enhance coverage according to the processes described below.

We will use this information to develop a conceptual architecture for the system, which we will analyze for loading, and will use to initialize the Master Budget, part of Task L. We will review this preliminary architecture with the Commonwealth, and will finalize and document it to the Commonwealth as two copies of the Draft System Architecture report. After a subsequent review meeting with the Virginia Project Manager, we will finalize the report and provide 20 bound copies and one unbound copy to the Commonwealth. We will post the document on the Intranet.

G1.02 Microwave System Design

Concurrent with the LMR design task, we will design the microwave (MW) system using the LMR sites identified as necessary in the coverage analysis. This process begins with an assessment of traffic loading requirements, which will include both the requirements placed on the MW network by the LMR system and external requirements that might be placed on the network by various agencies. We will include agency requirements to the extent that they are received by HSMM in a timely fashion. We will also include the loading anticipated as a result of the Intranet designed and implemented as part of Task J.

The LMR coverage analysis process will result in a preliminary location of radio sites. These sites will be used to establish a preliminary MW routing plan, which will be prepared and refined with capacity route redundancy and failure considerations in mind. We note that failure in a microwave system includes the possibility of equipment failure, and path failures that result from propagation anomalies – mainly due to weather events, ducting (in coastal areas) and spurious reflections.

The routing plan, which will use as many current VSP microwave sites and links as reasonably possible, will identify the need for new or relocated sites. Each of the new or relocated paths will then be analyzed, resulting in an engineering path design. We will develop a microwave channel plan that will be provided in draft form to the Commonwealth. We will then review the plan with the Virginia Project Manager, and will provide the channel plan in final format with six bound copies and one unbound copy. We will post the document on the Intranet. We will then present our findings

from both the microwave and LMR analysis in a meeting with the Commonwealth, as well as interested Federal, City, and County agencies in Richmond.

G1.03 Coverage Analysis and Documentation

HSMM will first conduct a Computerized Propagation Analysis for the existing 45 LMR sites comprising the VSP network, using the reasonably achievable design parameters established during the technologies assessment. Using this information, we will identify areas where coverage is projected to be inadequate. The coverage analysis will be based on the use of mobile radios throughout the Commonwealth, and will take into consideration local terrain, restrictions placed by the FCC in parts of the Commonwealth, and the signal levels required for a VHF trunked system to operate correctly. We note that part of Task D will be to ascertain the necessary design levels for various types of VHF trunking.

We also note that some of the agencies (such as Capitol Police) may require in-building coverage.

We recognize that there will be a number of antenna configurations and locations on vehicles for the users of this system. We will design the system to be able to accommodate antenna gains and locations that are less than optimum. This will include antennas that have 3 dB less gain than standard antennas, alternate mounting locations (for example the fender cowl or the rear deck), reduced gain antennas (such as disguised antennas), and the use of antennas on less than optimum mounting surfaces (such as a light bar).

Coverage design will take into consideration the coverage recommendations of TSB-88, which is the Telecommunications Industry Association (TIA) report on Wireless Communications Systems Performance (Radio Coverage). We will initially design coverage to the availability level of 98.3% (mobile radios outside buildings). We will review this design parameter with the Commonwealth after the first pass of coverage analysis, to determine if the design target should remain at that level or be modified in order to address the operational needs and the budgetary constraints of the Commonwealth.

We recognize that a system that is designed for mobile radio coverage outside buildings, (except for the Capital Police in the Richmond area) will not provide sufficient signal for the universal use of portable radios area. There are however, a number of agencies that require the use of portable radios. In order to economically design a system within reasonable fiscal constraints, the use of a vehicle-based repeater will be necessary.

A mobile coverage design provides coverage identical to that expected between a vehicular repeater and the fixed equipment. Coverage between the portable radio and the vehicular repeater is not a design parameter of this radio system.

Our coverage analysis facility, the Terrain Analysis Program (TAP), uses a computerized Longley-Rice model applied to terrain data obtained from the USGS 3-second terrain database. Softwrite has developed the model, in partnership with HSMM. HSMM incorporates this model into a wide–area model developed by

HSMM, to determine the projected coverage produced by multiple communications sites working statistically together to provide the requisite coverage. Results are cross-checked against 7-1/2 minute USGS maps of the area, to minimize the effect of terrain anomalies.

G1.04 Assess Quiet Zone Impact

As part of our analysis we will take into consideration the effects of incorporating FCC restrictions associated with the National Radio Astronomy Observatory (NRAO) in Green Bank, WV. We note that the current VSP sites are "grandfathered" into the Quiet Zone. We will consider these "grandfather agreements" and any other coordination documents in our design.

G1.05 Submit Coverage Analysis Report

We will incorporate the new sites identified into the propagation analysis, review the analysis with the Commonwealth, and provide a report to the Commonwealth. We will provide two copies of the report in draft form, and six bound copies in final form. We will post the document on the Intranet.

G1.06 Review Coverage with Commonwealth

Prior to delivery of the draft report, we will meet with the Commonwealth to discuss the coverage determined to that point, and to identify additional sites that might be reasonable for extending coverage into areas where additional coverage levels may be desired. We anticipate focussing first on using existing VSP sites, then on radio sites used by other agencies, then on state owned land, and then on existing non-state owned radio sites. If sites are still needed, we will work with the Commonwealth to identify potential undeveloped radio sites.

In the design of any wide area two-way radio system design, there is a tradeoff between coverage and cost. We plan to meet regularly with the technical committee in order to discuss our coverage and cost estimates, to identify locations and areas that need additional coverage, to establish the cost of providing that coverage and relate that cost to the agency requiring it. In this way we expect to optimize, to the extent possible, the coverage as a function of cost for the Commonwealth. We expect this to be a give and take process that involves the affected agencies. There must be a point at which this process is agreed to be completed, so that specifications and procurement may be finalized. Extending coverage into areas in which it is deficient means that one of the following three processes must occur:

- adding a new site;
- relocating an existing site;
- adjusting site parameters (such as tower height, antenna pattern, etc.).

We will work with the Commonwealth to optimize these procedures to the extent possible. We note that coverage requirements may be different for VSP and for the other agencies.

G1.07 Document New Sites Required

For this task only, HSMM has estimated, using currently available documentation and analyses, that there may be as many as 38 new radio sites necessary in order to provide mobile radio coverage to the level described in the RFP documentation. We generally have found that in a design situation for a multiple site radio system we need to develop coverage studies for more sites than those actually included in the final system design. This amounts to approximately 30% excess, to accommodate potential sites that do not turn out to work adequately with other sites. Taking these factors into consideration, this scope of work includes 50 additional coverage analyses for the VHF design, which should be sufficient to accommodate a requirement for approximately 38 new sites. Should the design requirements be such that additional sites beyond the 50 provided are required, or should the Commonwealth specifically request additional sites beyond the 50 be reviewed, we will work with the Virginia project manager to reach an agreement for an adjustment in scope, schedule and fee.

As part of establishing the site requirements, we will develop an opinion of the probable cost for the new sites, and incorporate those costs into the Master Budget developed as part of Task L.

For the purposes of this scope of work, identification of new radio sites is based solely on coverage considerations. While we recognize that actual siting will require consideration of other factors such as, availability of real estate, environmental impact, and legal issues concerning the lease or sale of property, these factors cannot be ascertained in advance. Additional coverage analyses as a result of relocating sites for reasons other than system design considerations can be done at the option of, and under the direction of the Commonwealth.

G1.08 Calibration of Propagation Model

Propagation models are by nature generally predictive devices. In an effort to tailor the TAP model to Virginia's terrain, and to take into consideration the variations in antenna patterns resulting from tower size, shadowing, etc., we will take various measurements from several VSP sites. Since the existing VSPHQ tower site in Richmond (the Test Bed Site) is reasonably representative of Virginia terrain; we will base our Virginia terrain calibration on that site and incorporate the information into the TAP program.

We will take measurements in the vicinity of a maximum of five VSP sites (including the VSPHQ tower site), for the purpose of modeling the antenna pattern(s) at that site. The sites will be selected to demonstrate tower size variation, shadowing from other devices on the tower, etc. We envision that these measurements will occur over the period of two consecutive weeks.

For each VSP site measured, we will run propagation analyses using a Longley-Rice based analysis tool. We will characterize the area surrounding the site by tile, establishing characteristics such as vegetation, terrain variance, etc. We will then measure the signal levels provided by the analog VHF test bed equipment, and compare these signal levels with those predicted by the model. By identifying variations between the measured and predicted performance (both variations in central

tendency and in variances), and correlating these variations with the tile characteristics, we can establish a calibration matrix of dB factors applicable to the test bed site. We can then apply these dB factors to other sites using the same model, for the characteristics identified. We note that transference of these dB factors from the measurement site to another site is not a precise process, and therefore there will be a statistical adjustment that will need to be included in the predictions to accommodate the differences between sites.

The specific process we intend to use in the calibration effort will include the following:

- The State and HSMM will agree on appropriate existing VSP sites.
- The State will install State supplied VHF conventional system equipment and an antenna system at the site, or we will use the existing equipment.
- We will test each site for the parameters required.
- The test data will be used to calibrate the computerized propagation analysis model described in Task G1.03.

G1.101 Microwave Field Surveys

The Microwave Path Design is initially an engineering study, using maps, databases, and other terrain information. Prior to implementation of a new microwave link, the path must be physically surveyed to verify that the terrain is as depicted on the map, and that there are no natural or man-made objects that intrude on the path. We will provide personnel and survey equipment for this purpose. This scope of work includes microwave field surveys on 24 new microwave paths. Paths may be added or deleted by the Commonwealth on a unit price basis, as shown in the fee schedule.

G1.102 (Not Used)

G1.103 Identify Commonwealth Properties

Should the search for new tower sites extend beyond the use of Commonwealth properties, we will assist the Commonwealth in identifying such properties and in evaluating their suitability for use. This might entail a physical survey, lease research, ownership research, environmental impact study, zoning application preparation, and many other possible items. This scope of work includes this service on a time and material basis.

G1.104 Simulcast Cell Coverage Analysis

We anticipate that the general design of the VPSLMRN will be of multiple site operation, with each site having a frequency set different from the adjacent “Cell”. Nevertheless, we also anticipate that there will be at least one location (Richmond) where there will be an in-building coverage requirement to serve agencies such as the Capitol Police. We may assume that, in those areas with higher level coverage requirements, a simulcast approach may be recommended. We therefore include in this scope of work simulcast analyses for two areas, each of which consists of up to

ten simulcast sites. This will include development of an opinion of probable cost for use in the Master Budget developed as part of Task L.

G2. Procurement

The VPSLMRN will be a large and complex communications system, and will very likely use technology in applications not in operation in this country. It is unlikely that more than one vendor would be able to provide a proposal for any specific design, since such a design would necessarily have some proprietary elements. This scope of work will, therefore, use a functional procurement approach, where we carefully design the requirements for the system, and then evaluate several vendors' proposals in response to those requirements. Each vendor proposal might use different configurations or protocols, but each proposal must provide for the functional needs of the Commonwealth and meet the performance specifications to be considered. All specifications will encourage vendors to submit a lease pricing option as well a purchase price.

We describe in this scope of work, a procurement process that will allow and encourage innovation in such designs. We will review this process in detail with Commonwealth procurement officers to finalize a procedure that allows the process to occur within the Commonwealth's procurement regulations. We note that it is essential to maintain careful records, and to maintain impartiality during this phase. The procurement process will have been defined prior to issuing the procurement documentation, and must be carefully and absolutely followed in order to minimize the possibility of vendor protest. Throughout this process, the Commonwealth will be the procuring agency, and HSMM will be acting in an advisory and assistance capacity.

The procurement process assumes a "Competitive Evaluation", with certain aspects of system design being specifically required, and others being described functionally in the specification.

The Required Specification Evaluation will consider items such as the following:

- Current VSP sites as licensed are the baseline of the system, and must be used.
- The current licensed ERP at the sites may not be exceeded in any direction.
- The current licensed height above ground at the sites may not be exceeded
- Quiet zone considerations (agreements) currently in place may not be exceeded.
- Coverage Test Plan

Non compliance to these Required Specifications may be considered as a basis for disqualification of the vendor proposal.

The Functional Specification Evaluation will consider such items as:

- Coverage Guarantee, tested as described in the Coverage Test Plan
- System Capacity, based on the number of units supported under given per unit loading criteria

- Ability to provide the baseline functionality in areas such as wide area roaming; console/dispatch, site design (to specified demarcation points)
- Terms and conditions
- The ability to provide multiple sources for subscriber equipment
- Predictors that the vendor and the technology will be viable over the life of the system
- Capacity of the vendor to manufacture and install the project on time and within budget
- Maturity of the technology and the product line
- Ability of the system design to act as a platform for identified and projected emerging technologies
- Adaptability to simulcast
- Total cost to the Commonwealth, including items such as price, impact on other procurements, Commonwealth management effort, and use of Commonwealth resources
- Schedule

While Functional Specification items, for the most part, will include baseline functional requirements, the vendor will be evaluated on their ability to achieve (and in some cases exceed) the baseline specifications on a weighted scale.

Throughout Task G2 and G3, HSMM assumes in this Scope of Work, that there will be a maximum of eight separate vendors and five separate procurements involved as follows:

- LMR system procurement, with up to two separate vendors under contract.
- Microwave system procurement, with one vendor under contract.
- Site Facilities procurement (including towers, site development, power and backup power, grounding, security, HVAC, fire detection and suppression, and the like except when provided as part of one of the other procurements), with up to three separate vendors under contract.
- Mobile data equipment procurement, with one vendor under contract.
- Intranet procurement, with one vendor under contract.

Additional procurements or additional vendors may result in a change of scope, and an adjustment in fee and schedule. Demarcation points will be generally defined by the procurement areas described above.

HSMM shall provide the following in support of the procurements contemplated under this contract:

- Provide detailed/in-depth technical specifications (to include licensure; adherence to specific standards and regulatory requirements, etc.) to the project manager/contract officer in preparation of the solicitation document.
- Make recommendations for inclusion of any Special Terms and Conditions pertinent to the specific project.
- Provide a list of suggested vendors who are in the business of responding to such specific projects.

- Participate in the pre-bid/pre-proposal conference as a technical source in support of the project manager/contract officer.
- Prepare technical responses to questions/issues arising from the above conferences or resulting from the solicitation.
- Provide technical/cost evaluation support (of vendor responses) to the project manager/contract officer in the review of bids/proposals.
- Participate with the Commonwealth in identifying and developing negotiation issues and strategies.
- Participate with the Commonwealth, as a technical expert, in the conduct of negotiations.
- Provide documentation support of the total solicitation and evaluation process leading up to contract award.

G2.01 Specifications for LMR Upgrade

HSMM engineers are well qualified in system engineering and design, and we intend to accept full responsibility for the design of the system to the performance specifications of the Commonwealth as described in this scope of work. The LMR equipment vendor's engineers, however, are uniquely qualified to do detailed site design and system integration design, since they have access to design information specific to the current revisions and versions of the equipment they work with. This information, at the detail design level, is not provided on a current basis to outside personnel either via documentation or training. The description contained in this sub-task section is based on HSMM providing functional, performance procurement specifications and the LMR vendor's engineers developing the detailed design to meet these specifications under our review.

HSMM will design the LMR system and sites to the functional, performance design level. This will include baseline coverage design, baseline antenna selection and placement, baseline antenna system design, baseline major equipment selection and placement, physical facilities and site preliminary design (including grounding design) at each site. The LMR vendor, as part of their proposal, will perform detailed system and coverage design according to the technology that they have established as their primary technology.

The LMR vendor, as part of their contract, will perform detailed site design under our review as part of Task G3. This will include all design and engineering necessary to implement the preliminary design at that site, such as (but not restricted to) cabling, rack-ups, grounding connection, equipment ordering, equipment mounting, and initial hardware and subsystem check-out and level optimization.

HSMM will design each LMR subsystem to the baseline design level. This will include network control specification and selection, circuit routing, baseline capacity specification (including expansion), redundancy design, site-to-site level interface specification, and baseline alarms and diagnostics design. The LMR vendor, as part of their contract, will perform detailed subsystem design including (but not restricted to) network control equipment ordering, network integration and alignment, cabling, and rack-up and mounting.

In the event that the coverage requirements dictate a simulcast subsystem design (most likely in an urban area such as Richmond), HSMM will provide a baseline design for each site and simulcast cell as described above. We note that different technologies and different vendors' product lines will cause dramatically different design approaches to simulcast. In general this is caused by the effects of data rate, word length, and operational protocols on digital access, and the fact that simulcast operation is substantially dependent on a complex interaction between tower sites. A design might provide a signal level adequate for 98.3% radio coverage and still have access denied in a significant number of locations due to other factors. In this area vendor experience is essential, and for this reason we will need to work with the LMR vendor in the preliminary design stage for simulcast subsystems even prior to the specification and proposal effort. We will specify, and require vendor conformance to the baseline simulcast performance requirements.

We have developed, over the years, a set of design specifications for wide area communications systems that has been updated regularly to address experience with specific vendors, during procurement, implementation, and test phases. We will tailor the specification package to the functional needs of the Commonwealth, finalize the system design, consolidate the list of non-fixed equipment, and assist the Commonwealth in the preparation of the procurement package.

We believe that in many cases it is in the Commonwealth's best interest to have the LMR vendor provide, in addition to the LMR equipment, certain site enhancements such as tower, building, HVAC, backup power, and the like. Historically, this has simplified the procurement and implementation process, and has established a single point of vendor responsibility for the implementation of each radio site. Schedule adherence is enhanced, and responsibilities are more straightforward. Should the Commonwealth desire, and as part of this scope, our specification package will include such physical facilities where it appears appropriate. We would also provide an independent specification package for physical facilities, as appropriate.

The Commonwealth will issue the Procurement package to pre-qualified vendors.

G2.02 Microwave Upgrade Specifications

HSMM engineers are well qualified in microwave system engineering and design, and we intend to accept full responsibility for the design of the system to the performance specifications of the Commonwealth for the wideband system as described in this scope of work. The microwave equipment vendor's engineers, however, are uniquely qualified to do detailed site design and system integration design, since they have access to design information specific to the current revisions and versions of the equipment they work with. This information, at the detail design level, is not provided on a current basis to outside personnel either via documentation or training.
The description contained in this sub-task section is based on HSMM providing functional, performance procurement specifications and the microwave vendor's engineers developing the detailed design to meet these specifications under our review.

HSMM will prepare functional, performance procurement specifications for the microwave sites and microwave system performance of the LMR sites. This will

include antenna selection and placement, antenna system design, major equipment selection and placement, preliminary facilities and site design (including grounding design) at each site.

The microwave vendor, as part of their contract, will perform detailed site specific design under our review. This will include all design and engineering necessary to implement the HSMM design at that site, such as (but not restricted to) cabling, rack-ups, grounding connection, equipment ordering, equipment mounting, and initial hardware check-out and link optimization.

HSMM will prepare functional, performance procurement specifications for the wideband subsystem. This will include network control specification and selection, circuit routing, capacity (including expansion) specification, redundancy design, link performance specification, and alarms and diagnostic design. The microwave vendor, as part of their contract, will perform detailed system design including (but not restricted to) network alarms, control, and supervision equipment ordering, network alignment, cabling, and rack-up and mounting at the network control location.

We envision that these specifications will be focussed on the procurement of equipment similar to that used for the digital links of the current microwave network. The microwave network can be described much more rigorously than the LMR network, and therefore, for the purposes of specification development, we envision a procurement process wherein two or more microwave vendors who have been pre-qualified as acceptable system suppliers bid on the project. Each proposal will be evaluated against the specification, and assigned evaluation points according to a previously agreed upon evaluation criteria and grading system.

G2.03 Coverage Test Plan

Radio coverage is a key issue for the VA PS LMRN. It is also an area where vendors have substantial differences of opinion in how coverage is to be measured. We suggest that the test philosophy presented inTSB-88 be used as a universal "leveling field" for the procurement documents. TSB-88 does not describe a test plan, but rather provides guidelines for testing.

While the Commonwealth's design goal is a baseline 98.3% coverage availability throughout the Commonwealth, it will be the LMR vendor's responsibility to guarantee a specified coverage availability throughout the Commonwealth. As part of the procurement process, Vendor guarantees of coverage will ultimately be specified in the vendor/Commonwealth contract.

We will design the baseline system to the Commonwealth's requirements, the specifications will establish this as a baseline, and the Coverage Test Plan included as part of the specifications will describe the conditions under which coverage will be demonstrated.

We note that the vendor will design their system to exceed 98.3% coverage when they are required to guarantee that coverage level. We will take this into account when we establish sites. Each vendor's approach to their coverage guarantees will vary according to a number of business decisions that they make at the time. This may

mean, under certain circumstances, that they might require additional sites beyond those, which we deem as necessary to provide the requisite coverage. Under the procurement process envisioned in this scope, they would be required to use the sites established by the Commonwealth in advance, and to describe the level of coverage they would guarantee under that condition.

The procurement process described above takes this vendor response into consideration, and puts pressure on the vendors to respond to baseline coverage requirements competitively. Should vendors, as an alternate, propose additional sites to meet the requisite coverage, we will work as the Commonwealth's Project Manager to determine the impact of those sites, and the risk associated with a system that does not include those sites.

We include in this scope of work, the development of a coverage test plan as part of the procurement specifications. The test plan will address two components: verification tests by the vendor, and confirmation tests on the basis of a valid statistical sample by HSMM. We also understand that the Commonwealth may test some of the coverage independently. The system will be deemed satisfactory and accepted only if both the verification tests and the confirmation tests are passed. In the event there is a discrepancy between the verification tests and the confirmation tests, the discrepancy will be resolved before proceeding further.

We suggest that the specific test procedure, which includes specific test equipment to be used by the vendor for the verification tests, test routes, and documentation requirements, be reserved until later. Some elements of the test procedure may be included as part of the vendor/Commonwealth contract, and some elements (such as test routes) are best left to a time immediately prior to the acceptance test.

We will provide two copies of the test plan in draft form to the Commonwealth, will review the plan in a meeting with the Virginia Project Manager, and will include the final test plan in the procurement documents.

As we stated above, our general plan is to use TIA/EIA TSB-88 as a reference to define coverage terms and requirements. Since that document does not include a test plan per se, it will be incumbent on the test team to develop the specifics of the coverage acceptance test plan (CATP). The test plan will be designed to consider: the static receiver threshold (Gaussian environment) the faded receiver threshold (Rayleigh environment); lognormal fading; number of tiles; number of samples per tile; size of the tiles; and voice quality in an interference limited system.

HSMM's approach to preparation of a CATP is:

1. Static Receiver Threshold (Gaussian environment). This parameter is applicable only to fixed radios, such as control stations. The coverage requirements in HSMM functional, performance procurement specifications anticipate this condition, where a test is run over a specified period of time with the passing criteria set to a threshold value of field strength. This field strength is different than the threshold for the non-fixed mobile and portable radios.

2. Faded Receiver Threshold (Rayleigh environment). Generally, mobile and portable radios can be considered to be in motion, and Rayleigh fading becomes an important factor. The coverage requirements in HSMM's functional, performance procurement specifications give the threshold value for analog radios in terms of field strength (expressed in microvolts). The test for these values must be conducted in a moving vehicle where the median value is calculated from several hundred samples as the vehicle moves through 40 wavelengths. For digital performance, the bit error rate (BER) specified in TIA/EIA TSB-88 is used for the appropriate application. We note that there are different thresholds specified for public safety and other users.

3. Lognormal Fading. This is an another mathematical distribution function (similar to Gaussian and Rayleigh) often used to describe stochastic processes. In a coverage test, the analytical model for describing the process is relegated to a secondary consideration, since the actual measured data would govern the results and the pass/fail criteria. Fading that assumes lognormal distribution would be tested in the same manner as Rayleigh fading for moving vehicles.

4. Number of Tiles. The portion of HSMM's functional, performance procurement specifications that deal with the CATP requires the coverage area to be divided into test zones (often on the order of 25 to 100 square miles). The local terrain or geopolitical boundaries often dictate logical test zones. The vendor is required to guarantee coverage within each of the test zones. The test zone is further divided into "tiles" or "grids" by the vendor. The number of grids must be statistically significant for the test, especially considering the fact that all tiles may not be accessible. The results are tabulated as the number of passed tiles divided by the number of tiles tested. The "statistically significant" number of tiles is addressed in TIA/EIA TSB-88. We expect something of the order of 500 tiles per test zone as a typical number.

5. Number of Samples per Tile. In the coverage test a vehicle enters the tile at a random location with a random velocity. Usually the vendor will immediately commence the automated measurement sequence. The receiver will collect and record several hundred samples as the vehicle moves through 40 wavelengths. The HSMM functional, performance procurement specification requires the median value be calculated and then used as the pass/fail criteria (for analog field strength). A similar test sequence is done for digital performance, except that the BER is measured instead of field strength. In both cases, the final value for the tile is taken from several hundred individual measurements over 40 wavelengths.

6. Size of the Tiles. Given the size of the test zones and the requirement for statistically significant number of tiles, we expect the tile size to be about 0.5 x 0.5 miles. The vendor is required to provide the actual grid and tile locations prior to approval of the detailed coverage test procedure. This usually occurs shortly before the test is actually conducted.

7. Voice Quality. HSMM requires the vendor to provide a field strength of at least 0.5 microvolts at the receiver input port for analog radio performance. Our experience has shown that if the vendors achieve this signal strength, the owners will observe a minimum "delivered audio quality" (DAQ) of 3.0. For digital

operation, TIA/EIA TSB-88 requires a DAQ of 3.4 for public safety communications and a DAQ of 3.0 for all others. These requirements will be incorporated into the HSMM functional, performance procurement specifications for the Commonwealth's system.

G2.101 Phase 1 Review (Pre-Cutover Pilot System)

This task closely examines the Phase 1 system and equipment operation by exercising the system with a limited number of users simulating actual operational conditions, and applying the results of this pre-cutover testing to both the first phase and the design of succeeding phases. Phase 1 Review (Pre-Cutover Pilot System) consists of a 90-day Phase 1 Pre-Cutover Operational Evaluation, after which the Commonwealth may, at its option, commission either additional evaluation, or redesign of the system. During this period we would perform a number of tests on the system, participating agency personnel that are testing /exercising the system would provide operational feedback, and we would have regularly scheduled meetings and teleconferences with the Commonwealth to discuss the results of testing, system status, problems and other issues.

G2.102 Alarm System Design and Integration

The LMR system will include an alarm and diagnostic system as part of HSMM's functional, performance procurement specification and design. The Microwave system will also have an alarm and diagnostic system that will augment and probably update the existing system. It is convenient and operationally useful to integrate the two alarm systems, and also include site alarms. All facilities, towers, and radio sites are expected to have remote alarms to notify dispatchers of intrusion alarms and network operators of system and equipment malfunctions. HSMM will include the integration of the two alarm systems in the functional, performance procurement specification.

G2.103 Communications Center Upgrades

HSMM will incorporate new communications console equipment into the specifications, for each VSP headquarters location. The system will include means for independent dispatching to and from all agencies and localities that are supported by the system. Dispatch consoles will be capable of intercommunicating, including consoles from different agencies. The console equipment can reasonably be adapted for each of the other agencies as well.

G2.104 Contract Negotiation Assistance

As described above, we anticipate a separate procurement package for most of the new site development, tower modifications and construction, and provision of any required facilities. HSMM will assist the Commonwealth in evaluation of the towers and site development proposals, and negotiation of contracts with these vendors. We

include in this scope of work a total of 300 staff-hours at the Senior Engineer level and travel/lodging for 6 round trips. We believe this level of assistance will be adequate to cover 5-6 negotiation sessions.

G2.105 Procurement of the LMR Upgrade

During the vendor proposal preparation period, HSMM will respond to technical questions. We will attend a bidders conference in Richmond chaired by the Commonwealth. The Commonwealth will, with our assistance, escort vendors to sites for inspections, and respond to non-technical questions. HSMM will prepare and provide to the Commonwealth, within 5-7 working days, appropriate specification addenda and formal responses to issues raised during the vendor proposal preparation period.

HSMM will conduct a detailed technical evaluation of each vendor proposal and assist the Commonwealth with their evaluation of vendor proposals. We envision there will be a maximum of two proposals to be evaluated in detail. Should additional proposals be received, a screening process agreed upon beforehand will be used to eliminate the least viable proposals, to the extent that a maximum of two remain.

The technical evaluation will be a determination of compliance to the specification. We envision a multiple step process consistent with Commonwealth procurement regulations as follows:

1. HSMM communications engineers will carefully conduct a detailed technical evaluation of each selected proposal. Technical exceptions will be identified, and items that require clarification will be noted. A list of clarification questions will be established for each vendor. These will be consolidated with clarification questions developed by the Commonwealth reviewers.

2. The list of clarification questions will be provided to each vendor in hard copy form as well as in electronic format. The vendor will be required to respond to these questions within a specific time frame. This may require meetings with the vendor to identify issues and to review options.

3. HSMM will finalize a list of vendor exceptions. The Commonwealth, with HSMM assistance, will also establish the degree of deviation from the baseline system and subsystem functional requirements. This process will include the numerical ranking of each exception, which establishes the impact that the exception has on the ability of the proposed configuration to provide the specified communications. It will also establish a numerical value of the impact of deviations from the baseline system and subsystem functional requirements.

The Commonwealth with HSMM's assistance may, at the Commonwealth's option, enter into technical negotiations with one or both vendors concurrently. Face-to-face technical negotiations with the vendor(s) would be conducted in Richmond. Under this scenario, we envision one or two telephone conference call meetings and one two-day, face-to-face meeting in Richmond with the vendor(s). All concerned parties must come to the negotiation table well prepared and focused on completing the negotiations on time.

The intent of this process is to quickly resolve all major issues by concentrating on reducing the number of high impact exceptions in the proposal(s). The second goal is to stay focused and negotiate and resolve all remaining technical and contractual issues with the vendor(s) within the allotted time frames of the procurement schedule. If there are a few minor issues remaining, agreement on these minor issues can be reached during the second round of technical/contractual negotiations.

It must be recognized that each vendor will probably have as its standard offering, a system configuration that is specific to its product line. This generally causes proposals to diverge somewhat from that described in the procurement specification and contract terms. We envision a parallel technical and contractual negotiation process that will allow for vendor divergence to the point that when negotiations are concluded, the vendor will provide the equivalent required contractual, technical and functional capability that is contained in the procurement specification. We also envision that, at that point in the procurement process, any divergence from the functional requirements will have been established and agreed to among the Commonwealth, HSMM and the vendor.

HSMM will revise the initial technical functional, performance procurement specification. The Commonwealth will revise the contractual terms & conditions as required.

A second round of technical negotiations in Richmond with a supplemental conference call will be conducted. At this stage only minor issues will be addressed. We envision that one telephone conference call meeting and one two-day, face-to-face meeting in Richmond with each vendor will be required. Any minor technical issues that still remain can be resolved after contract signing, during the Design Review/Change Order process of the Implementation Phase.

Vendors will be required to provide a price proposal with their initial technical proposal. All initial price proposals will remain sealed.

The vendor(s) will be required to submit pricing amendments to their initial price proposal that specifically reflect the system changes as negotiated in the first round. The Commonwealth, with HSMM assistance will review the initial price proposals along with all pricing amendments for technical accuracy, which may entail a single clarification question letter to each vendor. The Commonwealth with HSMM assistance will rank the vendor proposals. We do not envision any vendor review meetings resulting from the price evaluation. One telephone conference call meeting with the vendor(s) is anticipated to review pricing and proposal status.

HSMM will prepare an evaluation report, which will provide a record of the process and results. This report will be provided to the Commonwealth, and will include the Commonwealth's recommendations for the most responsible and cost-effective bidder. The Commonwealth will then establish a formal recommendation. The technical and price evaluation would include a written analysis of each proposal as measured against the bid criteria. The evaluation report would then provide an overall ranking of vendor proposals and suitable comments for the Commonwealth's management and elected officials.

This aspect of the project is critical, and requires careful attention to detail and documentation in order to minimize the possibility of protest by the unsuccessful vendor. It is appropriate for the Commonwealth to have a very careful plan in place prior to embarking on the evaluation task.

HSMM will assist the Commonwealth in presenting the recommendations to Commonwealth Officials. This scope assumes an appropriate and reasonable number of presentations on two consecutive days in Richmond, Virginia.

Final contract adjustments concerning pricing, hardware, software and services will be accomplished during the Design Review/Change Order process of the Implementation Phase. HSMM will support the Commonwealth in finalizing additional contractual and technical adjustments resulting from the Design Review and Change Orders with the successful vendor.

We recognize that the Commonwealth requires the ability to purchase additional equipment at competitive prices for substantial periods of time after the implementation of the system is complete. Part of the procurement requirements and documentation, as well as the negotiation for the contract; will include provisions for long term procurement of both fixed and non-fixed radio equipment.

G2.106 Procurement of Microwave Upgrade

HSMM will assist the Commonwealth in the procurement of the microwave upgrade in generally the same manner as described for the LMR system above. The process will entail review with the Commonwealth and with the vendor(s), bidders' conference, clarification questions that must be answered by each vendor and a final evaluation by a team consisting of HSMM, the Virginia Project Manager, and other representatives as appropriate.

HSMM will assist the Commonwealth in its technical negotiations with the top-ranked Proposer.

We will assist the Commonwealth in the preparation of a presentation for Commonwealth officials, describing the process and the results.

HSMM will assist the Commonwealth in contractual negotiations with the Microwave Vendor.

G3. Implementation

The subtasks performed under G3 will be duplicated for each of the four phases, unless stated otherwise.

G3.01 Perform Coverage Testing

As each coverage area is complete, the LMR vendor will be required to test the area to demonstrate the level of coverage. HSMM will witness the tests, and using the

vendor's results, will analyze the test data. We will require that the vendor provide raw data in digital form. Should the subsystem fail to meet the coverage requirements, the vendor will be required to upgrade the site to a point that meets the requirements, and then retest the system.

HSMM will then perform an independent coverage test on random basis confirming the vendor's results. We anticipate that HSMM will test approximately 25% of the total coverage test area.

Only if the site passes both the vendor test and the HSMM test will it be deemed as having passed coverage acceptance. We will provide a test report and recommendations for approval by the Commonwealth. The test report will be supplied in six bound copies, plus one unbound copy. We will post the document on the Intranet.

G3.101 System Upgrade

Since Phase 4 will be completed at least three years after Phase 1, and since the normal vendor process is to improve and reissue products on a yearly basis, we are taking into consideration that the technology used in Phase 4 may be different than that used in Phase 1. Vendors strive for backward compatibility, so Phase 1 equipment will still work in the system. However, because of wide area compatibility requirements, any system implemented over a long period of time will generally end up operating at the level designed into the earliest phase, and not at the level designed into the later phases. This is true for both the infrastructure and the non-fixed equipment. Included in this scope of work is a Final Optimization Upgrade component in which we would provide oversight and technical guidance while the vendor brings all phases up to the latest revision in software, hardware, and operational capability, and tests the integrated system. During each Phase, and again after Final Optimization, we will review the vendor's working drawings, monitor the changes, and review the as-built documentation (Task M) not only for completeness, but also for the ability to be used for maintenance in a straightforward way.

G3.102 Design Review – LMR System

HSMM will take part in design review meetings as part of the LMR vendor's system design. The initial meeting would be part of the overall statewide design, and would establish and confirm the system architecture and overall design, as well as the migration plan, the fleet mapping process, and other considerations. Associated with each implementation phase would be a phase design review, which would address the specific phase design, siting, cutover, and other technical and operational considerations.

G3.103 Design Review – Microwave System

HSMM will take part in design review meetings as part of the microwave vendor's system design. The initial meeting would be part of the overall statewide design, and would establish and confirm the system configuration, channel routing, reliability targets, documentation requirements, and overall design, as well as the migration plan,

integration with the LMR system and schedule, and other considerations. Associated with each implementation phase would be a phase design review, which would address the specific phase design, siting, path studies, cutover, and other technical and operational considerations.

G3.104 (Not Used)

G3.105 On-site Construction Monitor

HSMM will provide one or more on-site full-time Resident Project Representatives (RPR) at the location of each phased implementation. The representative for the initial phase would be based in Richmond and would operate out of our Richmond field office. For subsequent phases, the representative would be temporarily assigned to the region in which the implementation is taking place for the duration of that phase.

Concurrent with subsystem testing, which is part of Task K, HSMM will visit each site both during construction and upon completion of construction, for the purpose of inspecting the work to confirm that it is done in a professional manner and in conformance to the specifications. We will develop a punch list for each site, and for each subsystem. A punch list is a list of deficiencies that must be corrected by the contractor or vendor. The punch list will identify deficiencies, which the vendor would be expected to rectify prior to testing or acceptance.

HSMM will review and monitor the vendor's ongoing design effort consisting of such items as the transmittals, drawings, and the like for the duration of the project. This will include monitoring of the FCC and FAA permitting process, which will be facilitated after implementation begins by the LMR and microwave vendors. We can assist in site acquisition for new sites, with the assistance commensurate with the needs as established by the Commonwealth.

We anticipate one pre-construction conference for physical facilities for each phase. We will review design submittals, comment, and make recommendations. We will work with the LMR and microwave vendors to verify that the submittals are complete and appropriate to the requirements of the specification.

We will conduct both announced and unannounced inspections of the radio and microwave sites to monitor construction in progress. In this manner we can identify discrepancies and problems while they are still manageable, and before they have a potential to have a serious impact on the project and schedule.

As part of the process we will issue technical memos, opinions, and reports as requested by the Commonwealth to address LMR and microwave issues as they occur. We will review Acceptance Test Plans as provided by the vendors, and make recommendations to the vendors about acceptability of the planned tests. We will work with the vendors to develop comprehensive system and subsystem test plans that demonstrate conclusively whether the system or subsystem has met the specifications.

G3.106 Payment Request Reviews

HSMM will review contractor requests for payment, establish the validity of each request, and recommend payment. We will track these requests and incorporate them in our Master Budget Model.

G3.107 Change Order Requests

HSMM will review contractor requests for change orders, assess the impact on cost, schedule, and design, and establish the validity of the request. We will make appropriate recommendations to the Commonwealth.

G3.108 (Not Used)

G3.109 Staging Tests

The VPSLMRN system is complex and substantial. We require the LMR and microwave vendors to stage the subsystems at their respective factories, prior to shipment to the field. This provides an opportunity to test the subsystem in a controlled area, and establish that it functionally operates as required. Many of the tests done at staging are repeated in the field, but the overall system concept is proven at staging in a location where factory technicians and engineering personnel are available for further investigation. Since the technology used in this system will not have generally been proven in actual operation, we consider the staging tests to be a critical part of the implementation process.

HSMM will work with the vendors to develop staging test plans. We will witness and take part in the staging tests, providing on-the-spot guidance and recommendations. We will analyze the results and provide the Commonwealth with a staging test report (30 days following each instance). We suggest that the Commonwealth send one or more representatives to the staging tests as well. Refer to Task K1.104 for additional staging testing information.

G3.110 Acceptance Tests

The specifications will require that a number of equipment and system tests be performed, in addition to the coverage tests described as part of Task G3. Many of these tests will be part of Task K. Some of them are contained here.

HSMM will witness site and subsystem tests, and sign off on the test sheets as they are completed. We will perform specific testing ourselves to verify that the testing was done accurately and impartially. We will monitor the 30-day burn-in test (refer to Task K 1.105), and provide a test report at the completion of that test. At the completion of the site and subsystem testing for each phase, HSMM will make appropriate recommendations to the Commonwealth for acceptance.

We will be present for cutover to verify that the cutover plan is followed carefully, and to provide guidance should the need come about to put the cutover process on hold.

Task H

H. The contractor shall design an interface that allows at the dispatch level, access for county and city public safety providers to the shared radio network. The contractor shall at least consider the overall impact on the radio network and the accessibility that can be provided to non-state government users. The network upgrade shall include an interface to facilitate other public safety providers interoperability. The contractor shall create a specification for other city and county public safety providers to obtain the necessary equipment to interface with the network.

The following sub-tasks address the work requirements for the above RFP Task

H. Network Interface

HSMM envisions two concerns that the Commonwealth is attempting to address with respect to Cities and Counties. The first concern is for the localities that will be actually using the system for public safety operations. This represents coverage and loading issues. The second concern is that all the localities in Virginia 95 counties and 40 independent cities that will each need an interface with the state agencies using the VPSLMRN. It is the second concern that is addressed here in Task H.

Each locality maintains a dispatch location for public safety. For purposes of this scope of work, we are assuming a single dispatch location for each locality, although investigation may find that this is not the case. We expect that interface to the VPSLMRN will be via a terminal located in the dispatch location, much the same as the dispatch location has a terminal that accesses the National Crime Information Center, the DMV, the Virginia Crime Network, etc. We further expect that the interface will be one of two configurations:

- A terminal connected directly to the VPSLMRN network, which will allow high speed access to the radio system and also to the agencies' headquarters and dispatch locations,

- A terminal connected via a radio link into the system that will have somewhat more limited access.

Subsequent subtasks for Task H describe how we plan to approach this.

H.01 Design Network Interface

HSMM will research and design an RF network interface, which would enable local county and city public safety providers, access to the VPSLMRN. We anticipate that the local county and city public safety providers would interface the LMR network at the dispatcher level by creating a soft patch between the existing local county or city public safety radio channel and the LMR network.

HSMM engineers will document the interface and functional requirements and data compiled from the user agency needs assessments. We will define and record interface attributes and analyze the loading/access impact on the LMR network. This process will enable us to finalize the network interface requirements and design and review the preliminary interface design with Commonwealth officials. Upon completion of the above tasks, we will prepare the final network interface design and requirements documentation, which will be the basis for the network interface specification.

We will rely on the Commonwealth to identify the participating localities, and to provide an accurate list of contacts, telephone numbers, addresses, FAX numbers, and e-mail addresses. We will send a letter survey to each locality, and will use the results to design the interface. We note that the level of design will to a great extent depend on the level of cooperation provided by the localities. Should we find inadequate responses from any locality we will notify the Commonwealth of that fact.

H.02 Specification for Network Interface

HSMM will develop a competitive bid specification based on the operational and functional requirements of the final network interface design. We will issue two copies of the draft specifications in accordance with the RFP to Commonwealth officials for their review. The Commonwealth will provide HSMM with a consolidated list of changes or comments, which will be incorporated in the final specification version. HSMM will issue to the Commonwealth ten bound copies and one unbound copy of the final network interface specification documents that will allow other city and county public safety providers to obtain the necessary network interface equipment to interface with the VPSLMRN. We will post this document on the Intranet. We envision that the most likely respondent to this specification will be the vendor who has been awarded the contract for the LMR system, and therefore we plan to issue this specification after the contract has been awarded for the LMR system.

Task I

I. The contractor shall perform a tower structural analysis on each tower that will be used, based on the additional antennas necessary for the additional channels, to verify that it is below 85% capacity in accordance with the latest version of EIA-222. The contractor shall generate the technical procurement, FAA, and FCC documentation necessary to replace any tower that does not meet the 85% standard or to perform any upgrade that is required such as replacement of a shelter, increasing accessibility, upgrading grounding, environmental controls, auxiliary power, or security. Emergency generators shall be capable of seven days of continuous operation. Ring grounds shall surround every tower and every transmitter shelter. A halo ground shall be installed in every transmitter shelter or room and perimeter ring grounds shall be installed around every tower and shelter.

The following sub-tasks address the work requirements for the above RFP Task

This Section describes our approach for the preparation of specifications for site upgrades, tower upgrades, and other physical facilities. We intend to proceed by developing a set of "master" generic specifications for site facilities, and then to tailor these specifications for each site as the situation dictates.

I.01 Structural Analysis for Each Tower

HSMM will perform a structural review of the towers that are candidates to be used in the Virginia Land Mobile Radio Network (VPSLMRN). We will use as a minimum criteria established in the latest revision of TIA/EIA-222 (Structural Standards for Steel Antenna Towers and Antenna Supporting Structures) as amended by the Commonwealth. In each case, we will review specific tower requirements with the Commonwealth prior to undertaking the structural analysis.

Prior to the site visit, the Commonwealth will provide to HSMM all available as-built or record drawings and other information concerning the conditions of the existing towers including designer, manufacturer and model number of the tower, foundation plans, and subsurface conditions at the time of construction. Where the documentation is available, it will be reviewed along with site inspection records and photographs taken during site surveys. Using a triage methodology, towers and other structures will be categorized. With written concurrence of the Virginia Project Manager, towers categorized as "Recommended Replacement" or "Not Used In New System Design" will not receive further analysis.

Remaining towers will be subject to further evaluation. This will be done on an "as authorized" basis by the Commonwealth, as described in the "added services schedule of fees". We envision that the evaluations will occur within a reasonable time period prior to implementation, scheduled in order to not impact the implementation of the LMR and Microwave subsystems. During this second evaluation, the towers authorized will be inspected by trained personnel to determine physical condition of members, to verify existing member size and position when compared to the record

drawings, and to verify location of existing antennas. Should high Electromagnetic Exposure (EME) radiation levels make it impossible to safely access the tower, the Virginia Project Manager shall be responsible for coordinating with co-located users to reduce power levels so that inspection can be accomplished. If the tower's structural condition, radiation levels or design make all or portions of the tower inaccessible, inspections will be performed from ground level.

This task provides for:

- Climbing measurement and inspection of existing towers by a project engineer (typically a licensed professional engineer)
- Verification of drawings/reports of the tower if provided
- Photo documentation of tower with proposed antennas, mounts and waveguide/cables
- Structural analysis of tower foundations/guy anchors to support the proposed loads if drawings on their design or construction are provided

We use an ultrasonic thickness micrometer to accurately measure wall thickness of pipe and tubing members.

This work is based on the following assumptions:

- At least 10 sites will be authorized and available for inspection
- Analyses will be performed in accordance with EIA/TIA 222-F
- COV will specify parameters in addition to EIA/TIA 222 such as wind speed and radial ice load
- Foundations will be evaluated only if drawings and specifications are provided.

Hard Copy of report containing photographs, schematic drawings and descriptions of:

- Existing tower condition
- Identification of any defective members observed
- Methodology and acceptance criteria used in the analysis
- Capacity of the tower to support the proposed loading
- Recommendations regarding reinforcement is appropriate
- Calculations (if requested)

If fewer than 10 sites are inspected at a time, there may be a fee adjustment for travel and per diem expenses and travel time.

HSMM will document structural condition, existing antennas and other loads. The inspection will also document all antennas for the required computer model study. Documentation will consist of general evaluation from the initial review of documentation and visual review, plus any structural analyses done on authorized towers.

HSMM will visually observe the exposed portion of the tower foundation to estimate the condition of the foundation. We will analyze any foundation drawings available.

We will advise the COV of whether in our opinion they should pursue further foundation analysis.

Based on the conditions determined from the site evaluation, a computer stress analysis will be performed on existing towers remaining in the proposed system. Analysis will be performed in accordance with the latest revision, in effect at the time of the site visit, of TIA/EIA-222 to determine if the tower is stressed to a maximum of 85% of its capacity or does not exceed sway or twist limitations established by the Commonwealth. Loading conditions will be based on final configuration of the proposed system antennas. The analysis will be based on anticipated loading conditions of existing antennas, proposed additional antennas required for the additional channels, ice and wind. In order to maintain system integrity, it may be necessary to temporarily load the tower to 100% of its capacity.

A written report will be prepared which will discuss structural conditions and tower capacities. Towers that exceed 85% of their capacity based on individual member stresses will be categorized "Tower Replacement Necessary." The report will indicate the approximate number of members that are overstressed (exceeding 85% of capacity) to aid in determining if reinforcing the existing tower is feasible.

A determination of the foundation capacity will be included only when published foundation documentation is readily available for evaluation. A teleconference will be held with the Virginia Project Manager to discuss the findings of the report. Upon completion of the review of the report, the Virginia Project Manager will provide written documentation advising HSMM actions to be taken with each tower. Should the analysis show that the tower condition is an immediate concern for public safety, the Commonwealth should be prepared to act immediately to mitigate the situation.

One copy of the report will be delivered and also entered on the Intranet.

I.02 Correlate Tower Data

HSMM will utilize information gathered in Task C, the existing tower documentation provided by the Commonwealth and the tower manufacturers. HSMM will correlate this information to form the basis for our recommendation for retaining a tower in the upgraded VPSLMRN, reinforcing a tower or rejecting a tower as unusable.

I.03 FCC Documentation

HSMM will prepare FCC Documentation for any new or modified site licenses at the listed locations. Coordination documentation for APCO applications will also be supplied. The Commonwealth will be responsible for fees associated with this task including license or coordination fees.

I.04 FAA Documentation

HSMM will prepare FAA Documentation for new or modified towers at the sites where modifications have occurred. Requirements for FAA notification of new tower

construction will be included in the vendor RFP. The Commonwealth will be responsible for FAA license filing fees.

I.05 New Site and Site Upgrade Design

HSMM will develop specifications for the design of new and upgraded sites. In an effort to leverage existing state efforts, we will request and review standard Commonwealth construction specifications for civil or electrical projects from appropriate Commonwealth agencies. If standard Commonwealth designs are not available, we will use HSMM designs. We will also review purchasing requirements, state contract items, and regulations for impact on specifications. Generic plans for key functional areas will be developed as guidelines throughout the project. Though the generic plan will often need to be modified due to site specific conditions, their presence generally allows quicker review cycles. Two meetings will be held with the Commonwealth with the goal of receiving approval for the following generic plans:

Generic Site Plan
Develop generic site environmental plan including grubbing, waste disposal, grading, backfill, compaction, and soil testing.

Generic Concrete Foundation and Pad Plan
Develop generic concrete foundation and pad plan. Define concrete composition and testing requirements, reinforcement, finishing, admixtures and inspections.

Generic Grounding Plan
Develop generic grounding plan including the requirement for a ring ground installation for towers and halo grounding system inside buildings and equipment rooms. (See Task I.06)

Generic Shelter Plan
Develop generic shelter plan prior to RFP to standardize shelters. Shelter construction, insulation, additional loads (HVAC and electric), bulletproof, appearance, roof type, enclosed generator, roof loading.

Generic Generator Plan
Develop generic plan for emergency generators. Fuel type (availability statewide), tank protection and placement (special environmental regulations). Determine maintenance, spare parts, and testing. We will include the requirement for seven-day generator operation.

Generic UPS Plan
Develop generic plan for UPS.

Generic Tower Plan
Develop generic plan for new towers. Define preferences for tower types according to required heights and land use.

Generic Accessibility Plan
Develop generic plan for site accessibility including access road width and construction. Determine any special requirements or deviation from generic designs for sites in populated areas or remote mountaintops.

Generic Security and Fire Protection Plan
Develop generic plan for site security. Determine fencing requirements, site lighting, security alarms, cameras, fire detection and suppression.

Generic plans will be modified as necessary for the detailed design of required LMR sites. Site Plans will include the effects of simultaneous operation of existing and new equipment during the transition from the existing to the new system. Commonwealth approval will be required following the Pre Planning Study (35% design level) of the schematics and site footprint. A second approval will be required upon completion of the Final Design, prior to production of the Bid Documents. The process assumes that one or more site contractors will be selected prior to the availability of detailed design drawings for each site. As site designs are completed, a change order will be issued for the site contractor who will provide a fixed price based on the final design developed for the site.

I.06 Grounding Design

HSMM will review the Commonwealth's grounding specifications for sites, towers, buildings, and equipment rooms. We will consider Milspec grounding specifications and will revise and issue our generic grounding specification to meet the Commonwealth's requirements.

I.101 (Not Used)

I .102 Facilities Implementation Construction Administration

HSMM will provide administration of construction of site development, and construction monitoring for new or modified facilities. HSMM will attend and lead pre-construction meetings for each site prior to development and construction. We will assist with coordination of power, telephone, and other utilities at each site. We will chair monthly teleconferences with the site contractor management for the term of the site service. We will perform site visits at four critical construction points including (1) following excavation/rebar placement/grounding ring (before concrete placement and backfill); (2) placement of shelter; (3) during tower erection; and (4) electrical UPS/generator test. We will review site vendor progress toward milestones and make payment recommendations. We will monitor resolution of non-conformances. Non conformance will be determined by HSMM using the specifications as a baseline. If there is a disagreement between HSMM and the vendor, the Commonwealth will make the determination. In the event that a question arises regarding the accuracy of the design and specifications prepared by HSMM, the Commonwealth will make the determination.

I .103 Procurement of Tower Upgrade

HSMM will identify potential bidders and make a recommendation to the Commonwealth, and assist the Commonwealth in conducting a prebid conference. The actual cost for advertisements will be the responsibility of the Commonwealth. We will assist the Commonwealth in the technical portions of the prebid conference, evaluate the technical section of bids, and provide negotiation assistance, for the tower upgrades. Due to the size of the project, it may be necessary to have more than one tower vendor. After review, we will meet with the Virginia Project Manager to discuss our recommendation. We will provide technical assistance to the Commonwealth during negotiations with the tower upgrade vendor.

I.104 (Not Used)

I .105 Implementation Oversight of Tower Upgrade

HSMM will provide inspections, administration of site development, and construction monitoring for tower upgrades. We will attend and lead pre-construction meetings for each site prior to tower modification. We will chair monthly teleconferences with the tower vendor management for the term of the tower service. We will perform site visits during tower upgrade or antenna placement. HSMM will review tower vendor progress toward milestones and make payment recommendations. We will monitor resolution of non-conformances.

I .106 Specifications for Tower Replacement or Upgrade

HSMM will review the findings of the site surveys and tower analyses with the Commonwealth's Project Manager and obtain approval for those towers that are to be replaced or upgraded.

Based on the Commonwealth's notice to proceed, HSMM will produce Design Development Documents for replacing or upgrading of the agreed upon towers including structural elements, rerouting of cables, etc.

HSMM will meet with the Commonwealth to approve the design. Upon Commonwealth approval of the Design Development Documents, HSMM will develop Final Design Documents for Commonwealth review. Following review and approval, HSMM will submit Bid Documents to the Commonwealth for Bidding. We will provide the Commonwealth with eight bound copies and one unbound copy of the Bid Documents. We will post this document on the Intranet.

The specifications will include a requirement that the vendor provide certified soil and concrete testing by an independent laboratory.

Task J

J. *The contractor shall integrate existing State Police law enforcement mobile data equipment (a maximum of 431 units) into the upgraded radio network. The same radio for voice communications shall be used for data transmissions. The law enforcement mobile data infrastructure shall be integrated into the State Police data infrastructure. The contractor will plan the removal of the wireless modems from the patrol vehicles and coordinate the implementation of the mobile data wireless transmissions using the upgraded mobile radios. The contractor shall verify that these 431 converted systems will continue to operate effectively on the LMR network. The contractor shall update the technical procurement documentation that was used by the State Police to purchase the previous 400 mobile data terminals. The contractor shall prepare technical procurement documentation to obtain and install 1000 mobile computer terminals. The contractor shall inventory, oversee the installation into the VSP patrol vehicles, and verify the testing of the additional 1000 mobile computer terminals. The contractor shall develop a separate inter/intra agency mobile/fixed data intranet using the microwave network.*

The following items were agreed upon during negotiations:

The contractor shall prepare technical procurement documentation to integrate existing State Police law enforcement mobile data equipment (maximum of 431 units) into the upgraded radio network.

The following is a design goal for the Intranet. Deviations shall be agreed upon between the COV project manager and HSMM.

There will be a main Intranet Server and a main Data Server that will be ultimately connected at a switched hub in Richmond (initially at the contractor's Richmond's office). The data will be related to system and equipment documentation, project status, and any administrative information that the project might require. Thus, the contractor data files to provide this information could be on the same physical server as the Intranet server. Later on with the mobile data installations, additional data will need to be accessed, e.g. HazMat, VCIN. RJ45 jacks will exist at each MW site to allow technicians to connect directly to the Intranet Server using the capacity of the microwave system. This allows a higher connection speed for downloading repair manuals and other documentation than would be possible using a wireless connection. An interface, e.g. between a laptop or PC and the MW system, will have to be provided. One port of the Richmond Intranet switched hub will be connected to the microwave system through a router. There will be a router connection from the MW system, via a dedicated Frame Relay circuit, to the corresponding router, located at the VSP SPHQ computer room. The other side of this last router will be connected through the VSP firewall (already existing) to the VSP SPHQ LAN. The Intranet Server will be a node on this LAN. One or more ports of the Intranet switched hub will be available for connection to the state network through a firewall. This firewall

already exists at SPHQ. The existing State network and the new Intranet will be accessible by radio/microwave connection from the Mobile Data Terminals. Some of the MDTs will have access to the Intranet Server. Most of the MDTs will be dedicated to only accessing driver and vehicle information, obtained from the VA Criminal Information Network (VCIN) host, which is a node on the VSP SPHQ LAN. The only people having access authorization to the Intranet Server will be the contractor, COV system administrators/technicians, and later on, other subscribers to the system. Other fixed user terminal locations throughout the Commonwealth (as opposed to Mobile Data Terminals) will also need to be connected directly to the MW system to allow high speed connections for authorized user personnel to review project documentation, drawings, schedules, maps, network operations, and site operations. There will other users in the VSP Communications Division that will require access to the Intranet Server; these users will use their existing SPHQ LAN connections to gain access. Additionally, there will be some technicians or administrators at each of the VSP Divisions that will require access. The Division users will access the Intranet Server via the existing VSP FR network. The capacity will be dependent upon the amount of documentation, manuals, drawings, and project administration information that the project will require. Thus, it is difficult to estimate at this time. The only outside connections should be from the MW system via the Frame Relay circuit - between the MV system and the SPHQ LAN - and the VSP users who will access the Intranet via the VSP Data Network. Internet access may also be required (as a last resort) for some specialized databases. The contractor will have the ultimate responsibility for implementing a working Intranet. All documents, drawings, etc. must be converted to HTML paging, whether done statically or dynamically. The related hardware, software, and web page design (HTML) will be obtained through a procurement document prepared by the contractor. The contractor will insure the connectivity from the MW system to the Intranet Server at SPHQ.

The following sub-tasks address the work requirements for the above RFP Task.

J1. Mobile Data Integration

J1.01 Determine Commonwealth Information Technology Strategy

HSMM will meet with key Commonwealth stakeholders in Richmond. HSMM will determine VSP data infrastructure regarding Network and Desktop Operating Systems (Windows NT/Windows 9x/Unix/Linex/Novell). We will review existing Vehicle data equipment including documentation for equipment, software, and protocols. Additionally, we will review the existing network host system that provides the interface between the radio system and the VSP computer network. Our review will encompass documentation for equipment, software, data streams, and protocols. Based on this review, the capabilities of existing hardware will be determined. Connections to existing data management systems will be reviewed including the database engine utilized, database scheme, and the volume of existing data needing conversion. Reviews and recommendations will be documented in a letter report, which will be provided to the Commonwealth, and discussed at a meeting in

Richmond. During that meeting we will discuss the various issues, and agree upon a course of action. We will deliver 20 bound copies and one unbound copy of the report and post the report on the Intranet.

As part of the Section J effort, we anticipate investigating the current design and implementation of the VSP data backbone and equipment in detail.

After we have reached a full understanding of the current system, we will proceed to incorporate an interface for this mobile data system to the overall VAPSLMRN. The intent is to allow the VSP to continue using the existing 431 data units on the new system, if it is economically and practically feasible. The intent is also to develop a migration process that will allow these units to be converted to the new system with minimal disruption to the users and the organization.

J1.02 Design system interface for existing Mobile Data system

Upon receiving approval of a course of action, HSMM will design a system interface to allow the existing 431 units to be integrated into the new LMR network. We envision that this will entail some infrastructure modifications or possibly some new equipment and updated software. The original equipment supplier will be contacted to determine the availability of "off the shelf" integration options. HSMM will also contact other manufacturers or integration vendors to determine the availability of on-board routers or "black box" converters to allow existing mobile data equipment to be used with new radio system. The Commonwealth will review our recommendation and provide us with notice to proceed.

J1.03 Develop RFP for subscriber equipment interface for existing Mobile Data system

HSMM will draft a Request For Proposal to obtain a system integrator to provide hardware and software for interfacing the existing 431 units with the new LMR network. The RFP will include a requirement for on-board router capability, installation and testing of the units in vehicles. Depending on the selected configuration, network host hardware or software may also be required as part of the RFP. The Commonwealth will assemble the procurement documents and conduct the procurement.

We will require that the selected vendor pass a prototype functional test prior to full-scale production. We will observe the prototype test to be held in Virginia, document test results, and recommend a course of action.

J1.04 Plan for removal of Wireless modems from Patrol Vehicles

HSMM will develop a cutover plan, which includes removal of existing Wireless modems from VSP Vehicles. In preparation for each implementation phase, HSMM will produce a detailed schedule for the change-out or modification of each division's mobile data equipment.

J1.05 Coordinate Mobile Data transmissions using upgraded subscriber equipment

In accordance with the configuration management plan developed as Task K, HSMM will coordinate the cutover of existing units to the new upgraded data system.

The configuration management inventory system database will be utilized to track the mobile data equipment. We anticipate that this will use barcodes, which we will require to be placed on each unit by the manufacturer. We will perform a receipt inspection of new hardware and physically inventory the units at the Commonwealth's warehouse facility, or at their option at a facility provided by the vendor. Receipt testing will be limited to a power-on test of a statistically valid sample of units. HSMM will create, modify and approve installation procedures in accordance with manufacturer recommendations. It is our understanding that all mobile data computers will be configured as laptops. The standard method of utilizing a laptop in a vehicle is to physically secure the computer in a docking station attached to a mounting bracket, plug in a power cord and attach the radio connection wire to an interface unit such as a PCMCIA card modem. To facilitate installation, the mounting bracket will be installed and inspected as part of the mobile radio installation.

J1.06 Test 431 subscriber units, verify operation

Following installation, HSMM will verify operation of the subscriber units. HSMM will establish acceptance test criteria for the mobile data equipment and system, review test procedures proposed by the vendor for incorporation of test criteria and work with the vendor to make test procedure modifications that will adequately test both the equipment and the system. Since final installation simply involves strapping in the computer and attaching two wires, we anticipate that all mobile data terminals (existing and a statistically valid sample of new) for a division can be operationally tested over a period of three working weeks (15 days). One week of this testing is part of the current section (J1.06) and two weeks are part of a later section (J1.11). Based on our current concept, the radio system interface test will be software based and may be performed automatically each time the computer is turned on. During the testing period, we will verify proper operation of all systems. Additionally, officers will be trained to identify non-conforming test results and trained to identify and correct user created problems such as improperly connected cables when laptops are switched in the field and passwords typed in the wrong case.

J1.07 Update VSP procurement documentation

HSMM will review the Commonwealth's Purchase Documentation for the existing 431 mobile data terminals including technical specifications, contract and change orders. We will work with the Commonwealth to incorporate any applicable new procurement regulations enacted since the original document was issued. We will also review the maintenance history of the existing units to determine common failure modes, failure rates, or operational history that should be addressed in the new procurement document. HSMM will make modifications to original documents, which will be supplied in MS Word 97 format, and provide 10 bound copies and an electronic copy. We will post the document on the Intranet. We assume, for purposes

of this scope of work, that the original document is available in electronic format, and that we will be provided an electronic file of the document.

J1.08 Specifications for 1000 Mobile Computer Terminals

HSMM will develop specifications for 1000 or more new Mobile Computer Terminals. We will investigate and establish the status of wireless open systems architecture, transport protocols, data encryption, and best of class solutions. HSMM will meet and work with key Commonwealth stakeholders to reach consensus on the Commonwealth's hardware and functionality preferences. It is our understanding that the preference for Mobile Data Terminals is a mounted laptop. HSMM will also determine and discuss with the Commonwealth if value-added functionality such as GPS/AVL system panic alarms are advisable.

Prior to developing an RFP, we will analyze the Commonwealth's bandwidth requirements by performing a system loading study. Frequency search is part of Task B. Should additional VHF band channels be required, they will be identified and pursued as part of Task B. We note that the use of an on-board router for the existing radios is designed to minimize the impact of this potential problem. HSMM will write a letter report for the Commonwealth's approval detailing the mobile computer system design basis. Following approval of the design basis, HSMM will develop a Request for Proposal for the new Mobile Computer Terminal. The review cycle will include a draft and a final RFP. Ten copies of each will be provided to the Virginia Project Manager. We will post the document on the Intranet.

J1.09 Inventory 1000 Mobile Computer Terminals

In accordance with the configuration management plan established in Task K, HSMM will coordinate the cutover of the new data units. The configuration management inventory system database will be utilized to track the mobile data equipment. It is anticipated that barcodes will be placed on each unit. HSMM will perform a receipt inspection of new hardware and physically inventory the units. Receipt testing will be limited to a power-on test and log-on script initiation. HSMM will create, modify or approve installation procedures in accordance with manufacturer recommendations.

J1.10 Oversee Installation of 1000 Mobile Computer Terminals

As part of implementation Phase 2, HSMM will develop a cutover plan, which includes installation of the new data terminals in Patrol Vehicles. We will also produce a detailed schedule for the change-out or modification of each division's mobile data equipment. Following installation, HSMM will verify operation of the subscriber units. We will establish acceptance test criteria for the mobile data equipment and system, review test procedures proposed by the vendor for incorporation of test criteria, and work with the vendor to develop test procedure modifications that will adequately test equipment and system. Installation will be in accordance with the narrative above for installation of existing units. HSMM will inspect a representative sample of installations on a statistical basis.

J1.11 Verify Testing of 1000 Mobile Computer Terminals

Following installation, the vendor will verify operation of the 1000 mobile computer terminals (MCT).

HSMM will establish acceptance test criteria for MCTs and the data infrastructure, review test procedures proposed by the vendor for incorporation of test criteria and work with the vendor to make test procedure modifications that will adequately test both the equipment and the system. Testing will be in accordance with the narrative above for testing of existing units. HSMM will test a representative sample of installations on a statistical basis.

J1.101 Data Upgrade Procurement – 431 Units

HSMM will assist the Commonwealth in procurement of the data upgrade for infrastructure and vehicles. HSMM will identify potential suppliers, attend a Pre-Proposal Conference, assist the state with preparation of the advertising, prepare addenda and respond to vendor questions. HSMM will assist the Commonwealth in the evaluation of vendor proposals in accordance with the specified requirements and provide technical assistance to the Commonwealth during negotiations.

J1.102-J1.103 (Not Used)

J1.104 Procurement of 1000 Mobile Computer Terminals

HSMM will assist the Commonwealth in the procurement of the data upgrade for infrastructure and vehicles. We will identify potential suppliers, attend a Pre-Proposal Conference, assist the Commonwealth with preparation of the advertising, prepare addenda and respond to vendor questions. We anticipate evaluation of the vendor proposals in accordance with the specified requirements and to provide technical assistance to the Commonwealth during negotiations.

J2. Wide Area Data Network

J2.01 Develop separate inter/intra agency mobile/fixed data Intranet

HSMM will meet and work with key Commonwealth of Virginia stakeholders to reach consensus on a proposed data Intranet using the microwave network. We will determine the Commonwealth MIS preferences for Operating System, Web Server and browser. The basic system design will be in accordance with the COV clarification letter regarding Intranet requirements dated March 2, 2000. A conceptual drawing including demarcation points is shown in Figure J-1 for the Richmond backbone and Figure J-2 for a typical site and remote agency. In our current concept, the main Intranet Server, the Data Server and any other required servers act as nodes on an Ethernet based project network. The Intranet will be the repository for project documents, documentation, technical manuals, and other items such as digital photographs. The project network will be connected to the VSP LAN through firewalls, routers and a dedicated frame relay circuit. Mobile data computers will communicate with COV databases or with the Intranet server through a mobile data

host computer and a firewall. High speed fixed connections will be available at each microwave site for connecting an Ethernet enabled laptop computer.

This connection will be through the Microwave system and will be available for connecting TCP/IP enabled equipment for monitoring and remote management. During the needs assessment it will be determined which remote agencies or offices will be connected through the Microwave system. The Microwave system will be designed with sufficient capacity to connect remote agencies.

In order to be successful, there will need to be detailed coordination between HSMM, the Intranet Vendor, and the Commonwealth MIS Departments. One key element of the coordination is to define demarcation points that establish where HSMM responsibilities for equipment and software end and COV responsibilities begin. The major demarcation points are the router before the firewall in the State Police Headquarters (SPHQ) Computer Room and the router before the firewall at any other remote location LAN connection. The HSMM level of effort is based on the COV providing the resources needed to interface the Intranet with the existing Commonwealth owned WAN/LAN. HSMM will review "replace or integrate" options with the Commonwealth and a course of action will be mutually agreed upon.

Should portions of the VSP (or other) LAN including but not limited to the Firewall, Servers, Routers, Network Operating System require upgrade or replacement to facilitate integration, the Commonwealth will expedite that upgrade consistent with the schedule agreed upon. The COV is responsible for providing and maintaining secure firewalls and virus detection to protect their networks from foreseeable events such as unauthorized access attempts and viruses. HSMM will "have the ultimate responsibility for implementing a working Intranet" as required in the COV clarification letter. We understand and accept this responsibility for hardware, software, databases, programming, and transport media on the HSMM side of the demarcation point. We will provide technical support through HSMM or the procured Intranet supplier to assist Commonwealth personnel in resolving compatibility problems that may exist due to limitations with hardware, software, databases, programming, or transport media on the COV side of the demarcation points.

We will establish system loading parameters and available bandwidth. We will determine how much bandwidth is available for use of other agencies. HSMM will write a letter report for the Commonwealth's approval detailing the Intranet mobile computer system design basis. HSMM will deliver two copies of the report and post it on the Intranet. Upon receiving approval, HSMM will write a Request for Proposal for the Intranet that addresses hardware, software and the continuing home page service contract. Ten copies of a draft RFP will be supplied to the Virginia's Project Manager.

We anticipate a meeting subsequent to the Commonwealth's receipt of the draft procurement documents. We will supply ten copies of the final RFP to the Virginia Project Manager for issuance to the appropriate vendors.

J2.101 Procurement of Intranet Hardware, Software and Services

HSMM will assist the Commonwealth in design and procurement of the Intranet hardware, software and services using the microwave network.

We will identify potential suppliers, attend a Pre-Proposal Conference, assist the Commonwealth with preparation of the advertising, prepare addenda and respond to vendor questions. HSMM will evaluate vendor proposals in accordance with the specified requirements and provide technical assistance to the Commonwealth during negotiations.

HSMM will require that the Intranet vendor establish and provide security measures for the Intranet.

J2.102 Oversee Installation of the Intranet

HSMM will develop a cutover plan, which includes installation of the new Intranet. HSMM will also produce a detailed schedule for installation. Initially, the Intranet backbone will be installed at HSMM facilities with a Frame Relay link to the VSP SPHQ Computer Room. When permanent facilities are available, the hardware will be moved in accordance with a cutover plan. Following installation and until turned over to the Commonwealth at the end of the project, HSMM or the Intranet Vendor will verify proper operation of the system up to the demarcation points and provide technical assistance to the COV in resolving interface problems that are the responsibility of the COV. We anticipate that a LAN Probe (network analyzer) and a fiber/copper cable tester will be used for analysis and optimization of system loading. Specifically, design, installation, coordination and testing will be performed for:

(1) The Intranet backbone,
(2) One dedicated frame relay circuit for Intranet connection to the Richmond VSP LAN,
(3) Ethernet RJ45 data ports and/or hubs for laptop connection at each radio and microwave site

Testing of Mobile Data Computer connectivity to the Intranet will be verified under Section J1.

It is anticipated that over the course of the project, additional site equipment may become TCP/IP enabled embedded web servers. This feature would allow advanced equipment status display and remote system management through the Intranet. Some Uninterruptible Power Supplies (UPS) currently have this feature and it is our understanding that some microwave equipment is incorporating this feature. Should this be the case, the Ethernet RJ45 data port can be connected to a hub that would be connected to TCP/IP enabled equipment and have a spare port for the on-site technician. Coordination of the installation and testing will be included with the equipment procurement, installation, and testing. While the Intranet will allow alarm status to be displayed, it is to be understood that the Intranet is not considered a viable replacement for a real-time alarm generator such as is provided through the radio system. By design, radio system alarm generators utilize components that provide

additional levels of software and hardware redundancy that cannot be incorporated into Intranets that utilize standard computers equipped with commercially available Browsers. Equipment alarm and system status will be available on the Intranet for information only and should not be used as the sole basis for evaluating the availability or operability of the radio system. It is anticipated that system status and alarm display on the Intranet will have a preset time delay.

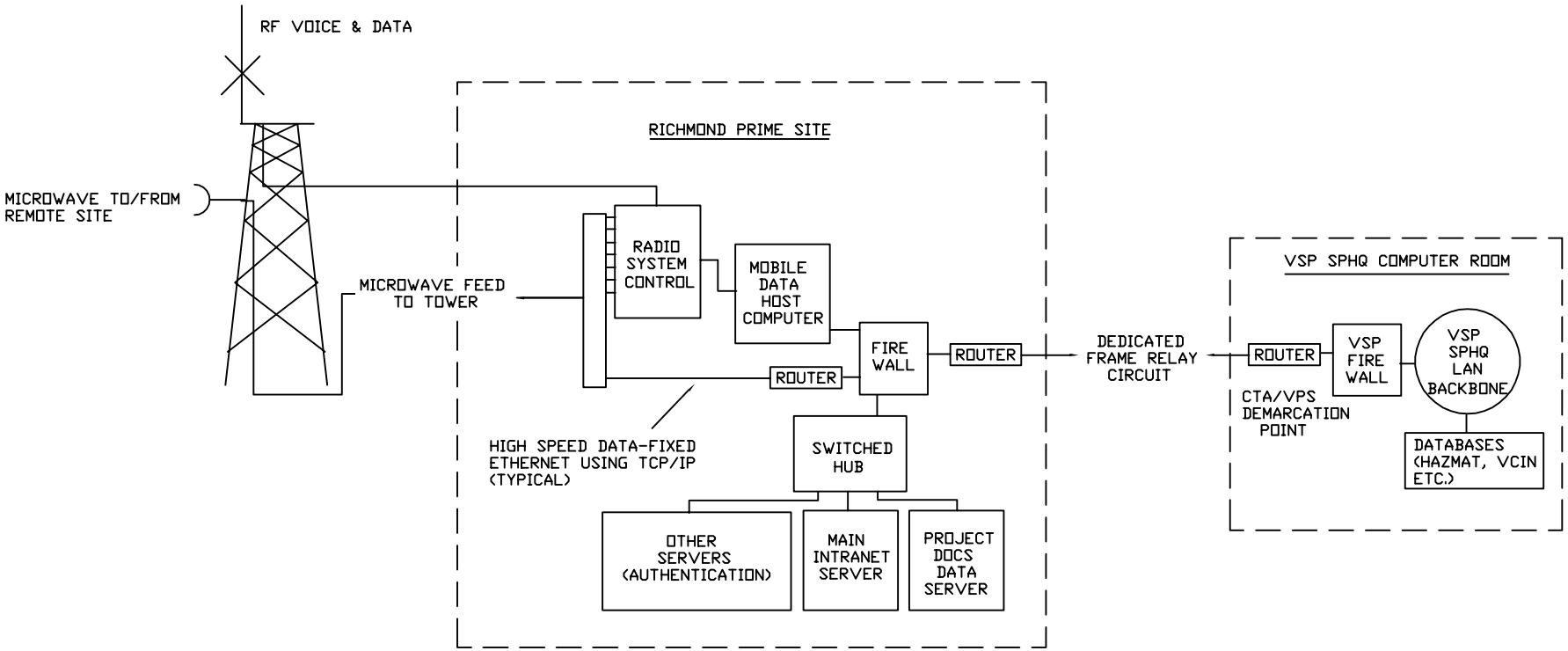
In the event that a remote Commonwealth of Virginia site requires access to the Intranet and does not have connectivity to the State Police Frame Relay system, HSMM will prepare circuit requests for connections from these users to the State Police WAN (or directly to Intranet Server at the State Police Headquarters) and report the status of the implementation of these circuits. The Commonwealth will be responsible for providing the actual circuit using one of the following options as illustrated in Figure J2:

(Option 1) Microwave hops to connect towers to agency buildings.

(Option 2) Fiber optic (or other) cables run from towers to agency buildings.

(Option 3) Frame Relay (or similar) connections from remote sites to Richmond.

HSMM will prepare a set of generic technical requirements for each of the three options for links to remote offices or agencies. The Commonwealth must include these technical requirements in COV generated procurement documents supplied to the various link vendors.

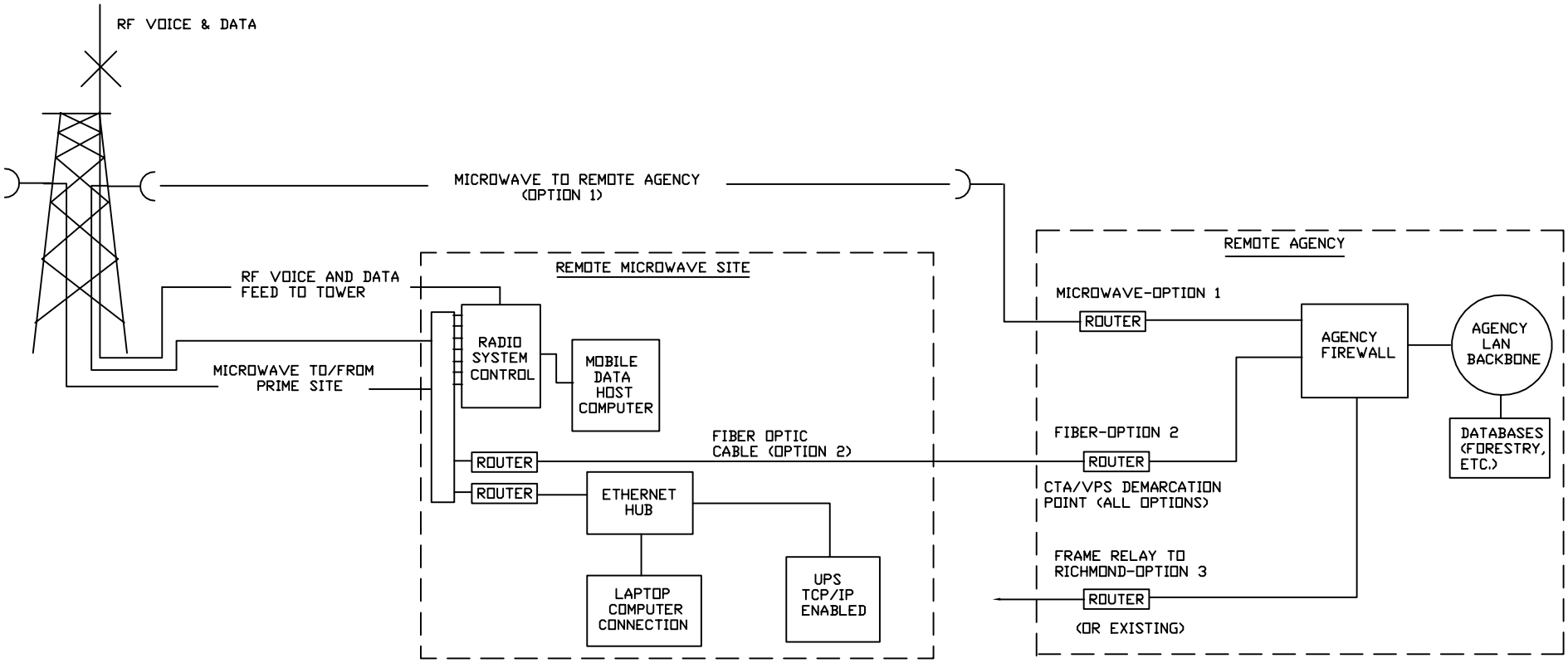


HAYES, SEAY, MATTERN & MATTERN, INC.
ROANOKE, VA.

TITLE
FIGURE J-1
BLOCK DIAGRAM OF INTRANET
(RICHMOND BACKBONE)

REVISIONS

DESIGN CTA	DRAWN RKS/DCB	DATE 3-7-00	
CHECKED DCB	APPROVED RKS	SCALE N/A	
CLIENT COMMONWEALTH OF VIRGINIA		SH. NO. OF	
PATH M:\FILES\91031\CADD\FIGURE J-1			



NOTE:

OPTIONS 1,2,3 ARE AGENCY PROVIDED ACCESS OPTIONS PROCURED BY THE COMMONWEALTH OF VIRGINIA IN ACCORDANCE WITH HSMM SUPPLIED TECHNICAL REQUIREMENTS

HAYES, SEAY, MATTERN & MATTERN, INC.
ROANOKE, VA.

TITLE: FIGURE J-2 BLOCK DIAGRAM OF INTRANET-TYPICAL SITE AND REMOTE AGENCY			REVISIONS
DESIGN CTA	DRAWN RKS/DCB	DATE 3-7-00	
CHECKED DCB	APPROVED RKS	SCALE N/A	
CLIENT COMMONWEALTH OF VIRGINIA		SH. NO. OF	
PATH M:\FILES\91031\CADD\FIGURE J-2			

Task K

K. *The contractor shall perform acceptance testing on all deliverables of subsequent contracts that were developed by the contractor. The contractor shall create and implement inventory control and configuration management. These processes will be taken over by the Commonwealth at the conclusion of the installation in a Division. The contractor shall implement the required channel plan and/or talk groups and program the new equipment accordingly. The contractor shall provide operator train-the-trainer training to designated personnel and a lesson plan for this training.*

The contractor shall ensure that all items and services procured meet the specifications (including receiver and transmitter performance testing on a representative sample for every type of radio). The contractor shall independently test and document the resistance of every grounding network. It is the responsibility of the contractor to rectify any deficiencies through the project manager of any subsequent contract. The contractor is responsible for the technical specifications and their ultimate performance. The contractor shall provide written certification that all transmitters, transmission lines, antennas, radios, and sites comply with the FCC radio frequency exposure limits. The contractor shall review the Commonwealth's RF Radiation Compliance Plan and recommend any changes that are necessary.

The following items were agreed upon during negotiations:

Train-the-trainer training will be conducted once at the VSP Academy. Technical training will be provided by the vendors under Task G. This training shall include the following subject areas: intranet, mobile data, land mobile radio (LMR) subscriber, alarm system, microwave system, network operations, and radio dispatch consoles.

Contractor shall take responsibility of identifying interference and attempt to eliminate it from the system. The contractor is responsible for reasonable efforts in locating the interfering transmitter and assisting in negotiating possible solutions.

The installation and testing of any mobile or portable device (radio or computer) shall be performed in the VSP Division where the user (operator) is stationed.

The contractor should identify the equipment they plan to purchase specifically for this project and associated costs. Any equipment for which costs are passed onto the Commonwealth should become the property of the Commonwealth at the end of the project.

The contractor shall assist in evaluation of the responses to the solicitations for which they generated technical specification, to the extent described herein.

Contractor shall coordinate with subsequent vendors in an attempt to rectify deficiencies. The contractor shall provide the Commonwealth administrative reports and technical support in an attempt to resolve the deficiencies,

Any remedial performance of the contractor shall not result in any additional contractor's engineering or implementation management costs to the Commonwealth. If corrective action is required, due to the contractor's deficiency, the contractor will provide the cost of implementation management in accordance with the contract for items such as writing the procurement documentation, quality control, documentation, testing, and training. The Commonwealth will be responsible for any costs associated with additional equipment or reconfiguration of the system as a result of the system correction or update.

The consultant will be designing an upgrade to an existing network to provide additional capabilities, radio coverage, and network integration in accordance with this scope of work. This will require additional contracts (based exclusively on the consultant's specifications) from several vendors to implement this requirement.

The following sub-tasks address the work requirements for the above RFP Task

K. Acceptance Testing

Acceptance testing occurs in three areas: Equipment testing, system testing, and coverage testing. Various individuals are responsible for conducting and verifying these tests. They include the manufacturer, government regulatory agencies, purchasers and potential purchasers, contractors and subcontractors. The results of this testing is documented and much of the documentation is available from the manufacturer. Therefore, some of the testing may be relied upon without further verification. Some testing may be relied upon through review of the test reports. The purchaser or his representative must directly observe some testing.

Subscriber equipment is tested exhaustively in the manufacturer's facility. Subscriber unit testing falls into four main categories, Environmental Tests, Full Specification Tests, Production Line Tests, and Field Tests.

- Environmental tests are performed during development and early production of a product. These tests include extended heat and cold tests performed in environmental chambers, shaker table tests, drop tests, and other MIL Spec 810 tests. These tests are often destructive to the radio unit. During the life of the product these tests are performed periodically to ensure that the basic design criteria have not been compromised during production.

  Because of the destructive nature of these tests and the prolonged test period required they are not performed on all or even a small sample of production units. They are instead performed on a time basis. Only one or two of each product types per month are tested in this manner. Tests of this nature are not included in this scope of work.

- Full Specification tests are run on a representative sample of production units. They are not run on all units. These tests include the testing of specifications that require an elaborate test set-up or laboratory test equipment and usually take a relatively long time to set up and perform. Some of these types of tests for transmitters are Conducted and Radiated Emission Tests, Audio Response Tests, and FM Hum & Noise Tests. Some of these types of tests for receivers would be Audio Response Tests, Adjacent Channel Selectivity Tests, and Intermodulation Rejection Tests. Intermodulation Rejection Testing, for instance, requires three signal generators to perform. Tests of this nature are not included in this scope.

- Production Line tests and Field tests are similar. They consist of tests that can be easily performed in the field or on the production line and they are tests that directly affect the performance of the units in the field on an every day basis. They include the receiver sensitivity (both 20 dB Quieting and 12 dB SINAD), audio distortion, audio power output and operating frequency. Production line tests often also include spurious response which is not considered a field test. Transmitter Field and Production Line tests include power output, audio distortion, and operating frequency. Field tests are addressed in this scope of work.

Each subscriber unit is shipped with a copy of the Production Test Report. Portable radio subscriber equipment is tested by the vendor upon receipt and again prior to issuing to the user. Mobile radio and control station subscriber equipment is tested concurrent with installation and again prior to issuing to the user. HSMM will perform a test on a representative sample of subscriber equipment prior to issuing the equipment to the user. This test will be the Field test described above. In the case of mobile radios the installation will also be tested for VSWR and noise. Control station antenna systems will also be tested.

Fixed end equipment is tested at the manufacturer's facility, and a test report can be shipped with the equipment. The fixed end equipment will be tested by the vendor after installation as an individual equipment device. HSMM will also conduct tests on all unique items, and a representative sample of multiply occurring items (such as repeater stations) .

System testing occurs in phases. The initial phase is done at the factory, during a staging test where all the equipment for a subsystem is assembled together and aligned to work together. Systems design problems are identified here, and rectified prior to shipment. After assembly at each site, the site is aligned and tested to verify that nothing has changed since the staging test. The final acceptance test is a system test where all sites in a subsystem are connected together using microwave or another wideband backbone.

This system test demonstrates both that the individual equipments are working properly and within specifications, and also that they all work together. HSMM will witness the staging tests. In the case of separate procurements for the microwave and LMR systems, the specifications will clearly identify demarcation points that will be used to test performance of each of the separate equipments. HSMM will also perform site testing and the final subsystem and system acceptance tests.

Coverage testing, which occurs in the same time frame as the system testing, is covered in Task G of this scope of work.

Test equipment will be purchased for this project to fulfill requirements contained in Tasks G and K. Schedule D shows the expected equipment to be purchased, or equivalent.

K1. Acceptance of Hardware and Software

K1.01 Perform Acceptance Testing of Subscriber Equipment

HSMM will include a requirement in the specification that the vendor will test all subscriber units upon receipt. HSMM will test a representative sample of the subscriber units at the warehouse facility provided by the Commonwealth or the vendor. HSMM will first review the quantity and types of subscriber units to establish an overall test plan and test schedule for testing the units. HSMM will then develop the test facilities for testing the units. Afterwards, HSMM will provide the personnel required to test the subscriber units. These tests are those identified above as Field tests.

The test results of each subscriber unit will be documented and the units tested by HSMM will be annoted as such, before the unit is distributed to a radio user. All failed units will be returned to the manufacturer for repair. High levels of failure for any equipment configuration will result in the return of the entire batch to the vendor for rework. HSMM will include a requirement in the specifications that costs for HSMM to retest equipment that has been returned to the vendor will be paid by the vendor. Once the unit is repaired, it will be re-tested, documented, before it is distributed to a radio user.

K1.02 Perform Acceptance Testing of Fixed Infrastructure

HSMM will include a requirement in the specification that the vendor will test all fixed infrastructure equipment. HSMM will test a representative sample of the communications Fixed Infrastructure Equipment after the vendor has completed his testing. HSMM will first develop a comprehensive acceptance test plan (ATP) that encompasses the specified equipment performance. Once the ATP is established, HSMM will coordinate the personnel, test facilities, and scheduling needed to execute the ATP and will perform the Acceptance test as described above.

The results of each test will be documented and signed off by HSMM and the Commonwealth. Any failed equipment test will be placed on a punchlist. High levels of failure for any equipment configuration will result in the return of the entire batch to the vendor for rework. HSMM will include a requirement in the specification that costs for HSMM to retest equipment that has been returned to the vendor will be paid by the vendor. All failed items will be corrected by the Vendor, re-tested, and documented.

HSMM will prepare a test report, which documents that the system passed the test in the ATP, and recommend acceptance.

K1.03 Create and Implement Inventory Control Process

HSMM will establish a process for inventorying new communication equipment and documents. First, HSMM will define the items to be inventoried and the procedure for entering the items into the inventory control process. HSMM will set up a database for tracking the items in the inventory using MS Office computer software. HSMM will manage the inventorying of the items until system acceptance. Once the subsystem is accepted, the inventory control process will be turned over to the Commonwealth at the conclusion of the acceptance of the VAPSLMRN by each Division.

K1.04 Create and Implement Configuration Management Process

The VPSLMRN system will be a large, technically complex radio system that is going to be used by a large number of diverse agencies, each with their own operational needs. Nearly every major piece of equipment, both fixed and non-fixed, will be driven by a microprocessor or computer. Each of the devices will need to have a resident control program. The subscriber equipment further will require each mobile and portable radio to be programmed with the radio frequencies, talk groups, and other personality considerations unique to the particular user group to which it is assigned.

HSMM will create and establish a configuration management process to track the various configurations of the equipments that make up the VPSLMRN system. This will include review of the configuration files themselves, and a management model that matches the appropriate configurations to the appropriate devices. When the project is complete, this configuration management model will be appropriate for continuing management of the system by the Commonwealth.

HSMM will review the vendor's configuration software, and will determine if it can reasonably be used in conjunction with standard applications such as Windows and Microsoft Office. Using the combination of a database management program and a spreadsheet program, we will develop the application. HSMM will test the integrated software package to find and correct deficiencies. HSMM will then prepare a document that conveys technical and operational aspects of the new integrated software package.

K1.05 Review and Turn Over Process to the Commonwealth

HSMM will review and turn over the configuration management process to the Commonwealth, with an appropriate training session, consisting of a one-day class of up to five people. The following items will be done in the preparation and presentation of the training course:

- Develop a course outline, presentation, and presentation aids for training.

- Develop the handouts and system documentation package for the students to be trained.

- Coordinate the course times, meeting place, and student numbers with Commonwealth.

- Present the course according to the schedule agreed upon with the Commonwealth.

K1.06 Program New Equipment with Appropriate Configuration(s)

HSMM will coordinate the process of programming the new equipment with the appropriate configurations. First, HSMM will coordinate with the appropriate representatives from the various agencies for development of talk group and subscriber configurations. This is done as part of Tasks A and B. HSMM will then conduct a training session to introduce elements of fleet mapping and provide guidelines on how to develop fleet maps for their agencies.

Fleetmapping is a complex interaction between the desires of a user agency for talk group configurations and the physical abilities of the particular radio. It relies on an understanding of the operational process of each user group, and may ultimately affect those operational processes. The initial fleetmapping will result in the configuration provided to the users at cutover. Historically, after the system is in use for some period (one or two years), we have found that additional or changed communications needs arise. We have also found that it becomes obvious to the user group that an integrated change in operational procedures accompanied by a change in their fleetmap will improve efficiency or service. The challenge in the initial fleetmapping is to be able to provide a viable fleetmap that can be used for several years before this happens.

HSMM will work with user representatives to finalize the initial fleetmap down to the individual Unit ID permission level. This will involve developing a plan for programming the system talkgroups, console configurations, and subscriber configurations. Actual programming will be done by the LMR Vendor as a part of their installation process.

HSMM will manage the implementation of the system configurations. We note that over the course of this implementation, there will be user initiated modifications to the fleetmap configuration. HSMM will monitor and document these modifications, and from time to time will, upon direction by the Commonwealth, provide instructions to the radio shop to reprogram the affected units.

K1.07 Implement the New Channel Plan

The channel plan is developed as part of Task B. Coverage is established as part of Task G.

In Task G, HSMM will review the coverage needed versus the coverage that can be licensed in various localities throughout Virginia. HSMM will also perform loading

estimates for the channels throughout Virginia. From the calculations, HSMM will develop a channel plan that meets the needs of the Commonwealth.

In this task, HSMM will work with the vendor to incorporate the new channel plan in the system and the subscriber equipments.

K1.08 Review the Commonwealth's RF Radiation Compliance Plan; Edit as Required

HSMM will conduct a review of the Commonwealth's RF radiation compliance plan. HSMM will then prepare a report recommending the changes needed to the RF radiation compliance plan. We will deliver one copy of the report and also place it on the Intranet.

K1.09 Certify Compliance with FCC RF Exposure Limits

The FCC has established (via bulletin OET 65) the Maximum Permissible Exposure (MPE) for RF radiation for various conditions. Each site must be reviewed to determine if the MPE has been exceeded. This review consists of an engineering analysis to determine whether a site is compliant.

Should the engineering analysis show that the site is not compliant, steps must be taken to bring the site into compliance.

HSMM will review and investigate each site to establish compliance with the MPE requirements of the FCC. First, HSMM will research the RF radiation of the equipment provided by the manufacturers. Then, HSMM will use the RF radiation information to calculate the exposure levels at the sites.

HSMM will prepare a document that contains the certifications and the supporting calculations. We will deliver one copy of the report and also place it on the Intranet.

K1.10 Test and Document Grounding Networks

HSMM will independently inspect, test and document the grounding at all LMR sites. HSMM will establish the test procedure and criteria for adequate site grounding. HSMM will submit a report that lists the measurements at the sites and make recommendations for correcting any sites that have inadequate grounding. Refer to Task G3.105 for installation inspections and punch list generation.

K1.11 Rectify Deficiencies

HSMM will establish a process for rectifying deficiencies found in the VAPSLMRN system through the Commonwealth's project manager. The deficiencies found in the system hardware and software will be documented in a punchlist. We will identify grounding deficiencies, and work with the vendor to rectify those deficiencies as part of Task G. HSMM will assign punchlist items to the vendor and keep track of the

progress of the punchlist items. Where there is more than one vendor at a location the punchlist items will be assigned to the correct vendor as identified by the demarcation definition. The punchlist items will be re-tested and documented to establish compliance.

K1.101 (Not Used)

K1.102 System and Subsystem Test Plans

HSMM will inspect and test the VAPSLMRN Communications System and Subsystem. HSMM will first develop a comprehensive acceptance test plan (ATP) that encompasses the specified system and subsystem performance. Once the ATP is established, HSMM will coordinate the personnel, test facilities, and scheduling needed to execute the ATP.

K1.103 System and Subsystem Testing

The results of each System and Subsystem inspection and test will be documented and signed off by HSMM and the Commonwealth. Any failed system and subsystem test will be placed on a punchlist. All failed items will be corrected by the vendor, re-tested, and documented. Refer to Task G3.105 for installation inspections and punch list generation.

HSMM will prepare a test report, which documents that the system passed the test in the ATP, and recommend acceptance. We will deliver one copy of the report and also place it on the Intranet.

K1.104 Staging Tests

HSMM will manage the development and execution of staging tests. First, HSMM will work with the Commonwealth to develop a comprehensive staging acceptance test plan.

Then HSMM will work with the vendors to execute the staging ATP in a factory setting. Because of multiple procurements and also because of Phased Implementation it is expected that there will be multiple staging events.

HSMM will develop a punchlist of the deficiencies found during staging. The punchlist item will be corrected and re-tested at staging or corrected and re-tested in the field.

HSMM will track the progress of the system once the vendor disassembles, packages, and ships the equipment to the field.

Staging Tests will be performed as part of Task G and the fee is included in Task G3.109.

K1.105 Subsystem Burn-In

The VAPSLMRN is envisioned to comprise a mixture of modified existing equipment and new equipment. During the first month after each subsystem is activated, equipment failures are anticipated. This should happen in a controlled atmosphere, where failures are tracked, and maintenance response is observed. This is called the "burn-in" phase.

HSMM will manage the implementation of the system burn-in. HSMM will work with the Commonwealth to establish the criteria the system has to meet to successfully complete burn-in.

All remaining punchlist items and deficiencies will be corrected and the system will be configured for its intended final operation before the start of the system burn-in. There should also be a sufficient number of users on the system before the start the burn-in test. HSMM will coordinate with the vendor to complete these tasks.

HSMM will monitor the progress of the system burn-in and document its performance. HSMM will verify that maintenance is performed for failed items and direct that the vendor re-start the test if the failure was defined as catastrophic.

K1.106 Cutover Plan

While the migration plan developed in Task F describes the migration process, each phase must be carefully cut over in order to reduce impact on user operations, and to expedite the conversion. This entails specific scheduling of individual vehicles and personnel, as well as the equipment. It also entails establishing a procedure for dispatch cutover, which must be integrated with the training schedule as well as the installation schedule.

HSMM will manage the development of the system cutover plan. HSMM will first coordinate with the Commonwealth to identify representatives from the various agencies for development of the cutover plan. HSMM will then write a plan for scheduling personnel and planning dual/transitional operation for each phase. Finally, HSMM will manage the implementation of the cutover.

K1.107 Headquarters Dispatch Cutover

HSMM will manage the development of the cutover plan for each of the major Dispatch Centers at the Headquarters locations (Divisional and main HQ). HSMM will first coordinate with the Commonwealth to identify representatives from the agencies for development of the cutover plan. HSMM will then write a plan for scheduling personnel and planning dual/transitional operation, and review the plan with the agencies. Finally, HSMM will manage the implementation of the communications center cutovers.

K1.108(Not Used)

K1.109 FCC RF Exposure Measurements

The FCC OET-65 document requires verification that RF exposure is below the maximum permissible exposure limit (MPE). This is normally done via an engineering study, which often establishes that radiation is within the MPE. In occasional situations, particularly in multi-user sites or sites where antennas are located low on towers, the calculation may show marginal compliance. In those situations, a measurement program is needed at that site.

HSMM will measure RF exposure levels to determine if the site complies with the FCC's RF exposure standards. HSMM will identify and conduct investigations at all applicable sites where calculated compliance appears marginal. HSMM will analyze the measurements to determine the amount of RF radiation at the sites.

HSMM will prepare a report that documents the radiation at the sites and make a recommendation for corrective action. HSMM will then manage and oversee the implementation of the system modifications needed to bring the site into compliance with FCC standards. If necessary, HSMM will measure the RF radiation at all places where corrections were made to document compliance. We note that in many cases this measurement for compliance after corrective action is taken is not necessary.

K2. Training

K2.01 Develop User Training Plans

HSMM will develop system use lesson plans for subscriber equipment. Console, dispatch, and system management equipment will require the development of additional specialized lesson plans geared to the specific types of equipments in use by the various agencies. HSMM will develop agency and division specific interoperability training lesson plans. Training will also be developed for procedures to be used during the cutover period from the old to the new system. All training and lesson plans will be developed in a 'train the trainer' format, and be approved by the Commonwealth. This plan will be developed prior to implementation of the system.

K2.02 Provide Train-the-Trainer User Training

User Training

HSMM will present the approved 'train the trainer' lesson plans to the designated agency trainers for subscriber users, dispatch and console equipment users. This training will include interoperability and 'cutover' procedures. This training is envisioned to occur in a single course over a three-day period, in the general time frame of Phase 1 implementation. It will occur at the State Police Academy. The Commonwealth trainers will provide subsequent training to all Commonwealth, Federal, and locality users.

K2.101 Maintenance Training

The selected radio vendor will provide maintenance training for the fixed infrastructure and subscriber units to Commonwealth personnel. HSMM will manage this process. The training will be delivered on location in the seven divisions during the four phases, in years two through five. The training shall include all equipment procured. HSMM will approve all lesson plans and monitor training.

K3. Quality Control

HSMM will be the single point of responsibility for the design and successful implementation of this system. Through carefully tailored and exacting specifications, we will create the requirement for the vendor to guarantee compliance and quality, we will test and monitor the system implementation and provide oversight to the vendor to identify problems and areas in which compliance has been compromised, and in the event that we find a problem or compliance compromise, we will work with the vendor to the end of having a successful completion. We take responsibility for the accuracy of our engineering specifications.

HSMM accepts responsibility for the quality and accuracy of its engineering and technical analyses, as well as the resulting technical specifications and reports. HSMM will monitor the vendors' work for compliance with the technical specifications.

In the event that the vendor meets the specifications and there is a system or equipment problem that turns out to be a error or omission in the specifications, HSMM will provide the services specified in this contract to correct the problem at no additional cost to the State. The cost of any additional equipment, equipment modification, or implementation services will be borne by the State. An example is if the coverage is tested in a particular Division and it is determined to be less than that required by the State, and that the vendor has constructed the number of sites specified in the RFP, HSMM would provide, at no additional cost, the engineering and implementation services for the additional site or sites required to meet the required coverage and the State would pay for the additional equipment, possible modifications to adjacent sites or network control equipment, and services required to implement and test the new site or sites.

We note, however, that the contracts with the vendors will be with the Commonwealth and not with HSMM. Obviously we can enforce provisions of the contracts to the extent that the Commonwealth also does so.

K3.01 (Not Used)

Task L

L. The contractor shall provide and constantly update the project schedule and budget for the project. The budget shall include contractor, infrastructure upgrade, and equipment costs. The contractor shall submit monthly reports to the Project Manager for the Commonwealth and to the Contracting Officer documenting progress and outlining intermediate results. The contractor's Project Manager shall meet with the Commonwealth's Project Manager monthly in Richmond. The contractor shall submit at least two draft versions of a deliverable document prior to final review.

The following sub-tasks address the work requirements for the above RFP Task.

L. Project Management

The VPSLMRN project is complex, both in technical design and in implementation. The RFP is clear in its requirement that the Commonwealth desires to retain a highly qualified Communications Consulting Engineering firm who will provide all technical services necessary for the assessment, research, design, specification, procurement and implementation oversight for a statewide radio communications system for Virginia agencies. We appreciate the implicit desire in the RFP and subsequent documentation that there be a team environment during this process. Indeed, the nature of this project, both in magnitude and complexity, as well as the desire of the Commonwealth to investigate and possibly use new and different technology mandates this partnership approach in order for the project to succeed.

It will be necessary for HSMM to closely manage the project, both internally and externally. The HSMM project team is necessarily extensive, and will require careful management. The VPSLMRN project team, consisting of HSMM, the Commonwealth of Virginia, the Commonwealth agencies, and, to the extent they participate, the localities and federal agencies, will require substantial coordination as well. Coordination of the VPSLMRN project team will be a joint effort between the HSMM project manager and the Virginia Project Manager. Coordination of the HSMM team is the role of the HSMM project manager.

Each task described in this scope of work has a project management element that is inherent in that task. In Task L, we have included overall project management considerations, scheduling, budgeting, project meetings and teleconferences.

This project has an expected duration of 72 months, in accordance with the schedule contained in Section 3 paragraph N of the RFP. Many of the Project Management costs are time related, and would increase or decrease commensurate with a change in schedule.

We recognize and understand the Commonwealth's desire to be part of development of each deliverable document. It is our intention to work with the Commonwealth to make sure that each document contains the information needed and in a format useful

for the Commonwealth and the project. To this end, HSMM interprets the requirement for two draft versions in the following way.

We will prepare a draft of each deliverable, and provide two copies to the Commonwealth for review. We will meet with the Commonwealth to discuss the draft findings and changes desired by the Commonwealth, and then will incorporate those changes in the final document. We have found in past projects that this draft/review/final process provides the optimum environment for review. In some key areas where the results of an investigation or a document could have a serious impact on later components, we anticipate interim work-in-progress review meetings even prior to publication of the draft.

In accordance with the documentation requirements of Task L, HSMM intends to supply the Commonwealth with multiple draft documentation that is required. We understand the Commonwealth's review process of distributing these draft documents to the applicable Commonwealth agencies and departments for their review and solicitation of comments.

Our process was developed in order to ensure accuracy in converting the Commonwealth's comments to text, and also to minimize elapsed time in the review process in order to meet the required schedule. We plan to submit Draft # 1 of each deliverable to the Commonwealth for review. We then will meet with the Commonwealth to identify and work out all concerns. The annotated Draft will constitute Draft # 2, which we will then convert to the final document. The final document will be posted on the Commonwealth Intranet.

As an alternate, we can submit Draft # 1 of each deliverable to the Commonwealth for review. The Commonwealth will then consolidate comments from all reviewers, and return these comments to us for incorporation into Draft # 2, which we will submit to the Commonwealth in Bold/Strikeover format for review. The Commonwealth will again consolidate comments from all reviewers, and return these comments to us for incorporation into the Final Document. There will be no additional cost for this alternate, however we anticipate that the alternate process including Commonwealth review time will take four to six weeks longer than our scheduled process for each deliverable, which will extend the overall project schedule. The COV project manager and HSMM will agree on the review process for each deliverable.

Projects of this complexity and magnitude require close coordination between all involved. Initially the project team will be the Commonwealth/HSMM partnership. As the project progresses, the vendors and contractors will become part of the project team. HSMM has found that during the majority of any project, weekly project management meetings are essential. These include face-to-face meetings and teleconferences. We have included a combination of these throughout the project in several areas. In L.06 we include monthly meetings in Richmond throughout the project. In L.106 we include bi-weekly project management meetings via teleconference to augment the monthly face-to-face meetings.

We anticipate that during the assessment and design phases occurring during the first 18 months, these meetings can be held twice monthly – one face to face, and one

teleconference. During implementation and acceptance, we envision these to be held three to four times a month – one face-to-face, and the remainder by teleconference.

All reports will be identified in the Schedule of Values.

L.01 Development of Master Project Schedule

The HSMM project manager will develop, administer and maintain a master project schedule for each phase and for the overall statewide implementation. HSMM will define and identify project and implementation tasks, time frames, interdependencies, deliverables, critical paths, and responsibilities. Schedules will use our CA Superproject scheduling software, and will comprise multiple levels of activities. Major project tasks and/or deliverables will be the highest level (Level 1), sub-tasks will be next (Level 2), and as many additional lower levels as needed will be added in a manner to make the schedule manageable and meaningful as a tracking device. The schedules can be displayed either in a PERT chart or a Gantt chart format. HSMM will issue draft master project schedules in accordance with the RFP to Commonwealth officials for their review. The schedule included as part of this scope of work is the initial pass at such a schedule. We will work with the Commonwealth to develop changes, which will be incorporated in the master project schedule initial version.

L.02 Update Master Project Schedule

By its very nature, a project schedule is dynamic. Not only are tasks added and deleted almost on an ad-hoc basis, dates are changed and tasks are registered as complete. The CA Superproject software and the HSMM scheduling manager will be part of the project management process. Once the master project schedule is issued, HSMM will maintain revision and updating control of all subproject schedules. HSMM will perform monthly status reviews of project schedule tasks, deliverables, sub-tasks, and sub-tasks elements. The master project schedule will be updated by HSMM and reviewed monthly with the Commonwealth before new revised schedules are issued. The master project schedule will be posted on the Intranet. However, only modifications made by the HSMM project manager on our version of the file will be official.

At the beginning of the project we will prepare a schedule of values that will be used as billing milestones. This schedule of values will be a subset of the project tasks and will relate to an applicable task to show a level of completion.

L.03 Develop Master Budget

The HSMM project manager will also develop, administer, and maintain a Master Project Budget for each phase and for the overall statewide implementation. HSMM will define and identify project and implementation budget items and how they relate to the master project tasks, deliverables including payment terms and conditions. The master project budget will include at a minimum, all contractor, infrastructure upgrade, facilities, consultant fees, and equipment costs.

HSMM will issue a draft Master Budget in accordance with the RFP to Commonwealth officials for their review. The Commonwealth and HSMM will work together to identify a list of updates or changes, which will be incorporated in the Master Project Budget initial version. We anticipate that this project budget will be maintained using the existing version of HSMM's Project Management and Budget System. This system is an in-house developed package using Microsoft Office applications. It will be provided in digital and paper format. Use of a different Project Management and Budget System is not included in this Scope of work.

L.04 Update Master Budget

HSMM will maintain revision and updating control of the Master Project Budget. HSMM will perform monthly status reviews of project schedule tasks, deliverables, sub-tasks, and sub-tasks elements and update the budget accordingly. The Master Project Budget will be updated by HSMM and reviewed monthly with the Commonwealth before a new revised master project budget is issued. We will provide information to the Commonwealth to assist in their preparation of the annual budget for this project. We will post the Master Project Budget on the Intranet.

L.05 Submit Monthly Reports

HSMM will provide monthly status reports to the Virginia Project Manager. These reports will present information on those aspects of the project with which HSMM and the Commonwealth were involved in the previous month, including a description of activities accomplished, problems encountered, problems solved, scheduled work, action and red flag items. Monthly reports will be issued in accordance with the reporting requirements of this contract.

L.06 Monthly Meetings

HSMM will meet monthly in Richmond with the Virginia Project Manager and the project team. HSMM will report and focus on project status items including schedule and/or budget items/issues. HSMM will document the results and minutes of each meeting and include them with the current or the next month's project report.

L.07 Biweekly Internal HSMM Project Management Meetings

HSMM will conduct biweekly internal project meetings via teleconference between applicable HSMM team members to review project status. HSMM will notify and confirm the teleconference meeting dates, times, attendees, and agenda. HSMM will lead and conduct the internal teleconference call meetings as well as record meeting results and manage action items. While these meeting records will not normally be distributed to the Commonwealth, they will be available for review by the Virginia Project Manager upon reasonable application.

L.101 Management Presentations

HSMM will prepare project status documentation (including schedule and budget items) for semi-annual Commonwealth management meetings. HSMM will confirm and notify attendees of the presentation date, location, agenda and time of the quarterly Commonwealth meetings. HSMM will prepare the presentation. The Commonwealth will determine who will actually make the presentation. HSMM may make the presentation or the Commonwealth may make the presentation with HSMM assistance. After the meetings are concluded, HSMM will prepare and issue meeting summaries.

L.102 – L.103 (Not Used)

L.104 Initialization Meeting

HSMM will conduct an Initialization meeting for the start of the equipment inventory and radio needs assessment task (Tasks A and C). At the meeting HSMM will outline the project objectives and methodology and solicit advice of all attendees. Key Commonwealth and HSMM representatives will be introduced. The intent of the meeting is to establish close working relationships between all parties. After the initialization meeting is completed, HSMM will prepare and issue meeting minutes and summary.

L.105 Contractor Review Meetings

During implementation, HSMM will conduct contractor review meetings to monitor and review installation activities and status. HSMM will organize on-site contractor meetings. HSMM assumes that approximately four meetings per installation site will be required. HSMM will conduct the on-site meetings with the contractor and sub-contractors and record meeting results, minutes and action items.

L.106 Twice Monthly Project Coordination Meetings

HSMM will set up twice monthly project coordination meetings via the Commonwealth's teleconference bridge with the Virginia Project Manager and project team to review project status. HSMM will notify and confirm the meeting dates, times, attendees, and agenda. HSMM will lead and conduct the meetings as well as record meeting results and action items.

Task M

M. *The contractor shall document the as-built design, infrastructure, network, systems, subsystems, software, firmware, and equipment. The documentation shall be delivered as each division is completed and updated as changes are made. This is to include all aspects of the LMR, microwave, and data networks. This documentation shall be generated in MS Office. Drawings of all network and system designs, towers, buildings, shelters, schematics of all electrical circuits, transmission lines, cabling, grounding networks, and wiring shall be provided in AutoDesk AutoCAD and shown as-built. The contractor shall take pictures with a digital camera to document the sites and towers as-built.*

The following items were agreed upon during negotiations:

All manufacturers' documentation not available in AutoCAD or MS Office shall be submitted in PDF format. As-built documentation shall include modifications and the final configuration. Updates to documentation shall be provided quarterly as required. Documentation described in this contract shall be available on the Intranet to the maximum extent possible.

The following sub-tasks address the work requirements for the above RFP Task.

M. Documentation

In accordance with the as-built documentation requirements of Task M, HSMM will deliver complete as-built documentation packages to the Commonwealth as each phase or division is completed. In the specifications, HSMM will require the vendor to provide record documentation for the as-built design, infrastructure, networks, systems and sub-systems, software, firmware and equipment. HSMM will include, in all specifications produced by HSMM, the requirement that vendors, suppliers and manufacturers of equipment, software and systems provide record (as built) documentation in AutoCAD, MS Office or PDF format.

This documentation will be placed on the Intranet as described in Task J.

HSMM will provide an additional copy of our final proposal and contract to the Commonwealth in electronic format, “sanitized” such that it contains no proprietary information. This “public” version will be appropriate for publication on the Intranet.

Documentation after each Phase is part of schedule blocks 17400, 17700, 17900, 18100.

M.01 Document As-Built Infrastructure

HSMM will specify, collect, and organize documentation of the communications infrastructure sufficient for use as maintenance documentation. HSMM will review

existing Commonwealth documentation policies for radio system infrastructure. As part of the initial survey, HSMM will also review Commonwealth implementation of policies. We will develop general documentation during that survey as described in Task C. This will be done once and not updated by HSMM.

Following the surveys, HSMM will write a letter report establishing project radio system infrastructure documentation requirements. These documentation requirements will form a part of any specification or procurement document, and will be required of any vendor or service provider associated with the project.

HSMM will review the letter report with the Commonwealth, make required report modifications, and obtain the Commonwealth approval for the plan. During the course of the project, HSMM will specify the format of the documents to be provided by the various vendors, collect the documentation, inventory it into a database, prepare and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. Our intent is to have the vendor transform their installation documentation into as-built documentation. HSMM will verify the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, coordinate, and assemble the documentation into a cohesive usable documentation package.

M.02 Document As-Built Facilities

HSMM will perform a review and report for As-Built facilities using the same methodology and restrictions established in Section M.01. As-Built documentation requirements will include: civil and mechanical drawings; calculations; floor plans; grounding drawings; and equipment manuals. HSMM will collect the documentation, inventory it into a database, prepare and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. We will provide As-Built documentation for new or modified facilities. Documentation for existing facilities that are not modified will be provided to the extent that it is generated, as part of Task C. Our intent is to have the vendor transform their installation documentation into as-built documentation. HSMM will verify the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, coordinate, and assemble the documentation into a cohesive usable documentation package.

M.03 Document As-Built Software and Firmware

HSMM will perform a review and report for As-Built software and firmware using the same methodology and restrictions established in Section M.01. HSMM specifications will state that Software documentation is to be provided in Microsoft Office or AutoCAD. If this is not possible, PDF format will be specified as acceptable. Source code is usually proprietary except when contracted directly from a system integrator. HSMM-produced software is proprietary. In the past, HSMM has recommended actions such as placing source code in the care of a third party to be opened only if the original vendor goes out of business or no longer supports the software. HSMM has also, on occasion, been able to negotiate non-disclosure agreements with software vendors to verify that interface protocols are, in fact, established and documented. HSMM will work with the Commonwealth and with

vendors to verify the quality of software and provide the best operating and technical documentation available. HSMM will collect the available documentation, inventory it into a database, prepare and transmit it to the Commonwealth as each division is completed, but not more often than quarterly. We will provide As-Built documentation for new or modified equipments. Documentation for existing equipments that are not modified will be provided to the extent that it is generated as part of Task C. Our intent is to have the vendor transform their installation documentation into as-built documentation. HSMM will verify the accuracy of as-built documentation with site visits during construction and at final acceptance. We will review, coordinate, and assemble the documentation into a cohesive usable documentation package.

M.04 Digital Photographic History

HSMM will review state documentation policies for electronic format photographic archives. HSMM will write a letter report establishing project photography requirements including: file type requirements; resolution; distribution medium; incorporating pictures taken by state personnel; etc. This scope of work is based on use of standard JPEG, BMP or other industry standard image file formats. Recommendations will be made in a letter report, which will be reviewed with the Commonwealth for approval.

HSMM will take pictures and transfer them to the required file format directly through a digital camera or by scanning photographs. HSMM will collect the available documentation, inventory it into a database, prepare and transmit it in digital format to the Commonwealth as each division is completed, but not more often than quarterly.

The image management requirements for this project will be implemented through the Intranet System described in Task J2.

We also intend to record some of the history of this project using conventional photographic methods, for our own use. Should the Commonwealth desire copies of these photographs, we will provide them as a reimbursable expense item.

M.05 Project Correspondence

The VPSLMRN project is projected to have a duration of at least six years, and to involve up to eight or more separate vendors. The HSMM team has subcontractors, and the Commonwealth includes multiple organizations as well. We consider it to be essential to establish a formal transmittal process for document control and correspondence, to be used by all organizations that are part of the project.

Early in the project, HSMM will establish a transmittal system for project correspondence. We expect that the Commonwealth and all vendors will utilize the system established by HSMM. An overall log of project transmittals will be maintained in electronic format by each organization, with a master log maintained by HSMM. The log will be published periodically, and all participating organizations will be responsible for verification of the accuracy of the log with respect to any correspondence that they generate.

Task N

N. *The network upgrade should be performed in accordance with the following schedule. A proposed schedule that delays progress from the following schedule should be justified and will factor into the scoring of the proposal.*

Solicitation Schedule	*Date Completed*
Consultant Contract Anticipated Award Date	*January 1, 2000*
*Facility Upgrade Solicitation Issued **	*March 1, 2000*
*New Facility Solicitation Issued **	*April 1, 2000*
*Towers, Transmitter Sites Upgrade Solicitation Issued **	*September 1, 2000*
*Mobile Data Solicitation Issued **	*January 1, 2001*
*Radio Equipment Solicitation Issued **	*January 1, 2001*
Radio Equipment Proposals Received	*April 1, 2001*
Radio Equipment Contract Awarded	*August 1, 2001*
Division 1 Equipment Received	*December 31, 2001*

Year	*Division(s) Completed*	*Date Operational*
2	*Richmond*	*December 31, 2002*
3	*Appomattox and Chesapeake*	*December 31, 2003*
4	*Culpeper and Fairfax*	*December 31, 2004*
5	*Salem and Wytheville*	*December 31, 2005*

** Note that all Solicitations will be issued by the Commonwealth.*

The following target dates and items were agreed upon during negotiations:

Consultant Contract Anticipated Award Date	*July 1, 2000*
Facility Upgrade Design Specification Released	*September 1, 2000*
New Facility Design Specification Released	*October 1, 2000*
*Intranet Solicitation Issued**	*January 1, 2001*
Towers, Transmitter Sites Upgrade Solicitations Issued (Possibly Three Vendors)*	*May 1, 2001*
Radio Equipment Solicitation Issued (Possibly Two Vendors)*	*June 1, 2001*
Radio Equipment Proposals Received	*September 1, 2001*
*Mobile Data Solicitation Issued **	*October 1, 2001*
*Microwave Solicitation Issued**	*October 1, 2001*
Radio Equipment Contract Awarded	*January 1, 2002*
Division 1 Equipment Received	*July 1, 2002*

Year	*Division(s) Completed*	
2	*Richmond*	*July 1, 2003*
	Pilot System Review	*October 1, 2003*
3	*Appomattox and Chesapeake*	*October 1, 2004*
4	*Culpeper and Fairfax*	*October 1, 2005*
5	*Salem and Wytheville*	*October 1, 2006*

During the initial planning period HSMM will prepare a detailed Master Project Schedule.

The following sub-task addresses the work requirements for the above Tasks.

Extensions to the project schedule that are caused solely by the actions of HSMM will not result in any additional fees charged by HSMM to the Commonwealth.

N.01 Network Upgrade Schedule (Master Project Schedule)

The Master Project Schedule is described in Task L.

From time to time, we will provide a single copy of the detailed project schedule, showing Level 1 (high level), and Levels 2 and 3 in PERT and Gantt format. A detailed schedule is an essential project management tool. In development of this schedule, we were able to identify and link all the aspects of the project as stated in the RFP, and the components critical to the project's successful completion that were not explicitly stated in the RFP.

This is a working schedule. It will form the basis, and will provide the detail needed to coordinate and track the various project components and the various organizations that must work together for the duration of the project. This includes the Commonwealth of Virginia agencies, the equipment vendors, the tower and site development vendors, and the members of the HSMM team.

Task O

O. The milestones for the project shall include at a minimum:

1. *Radio needs assessment approved.*
2. *Channel plan approved.*
3. *Infrastructure resources evaluation approved.*
4. *Existing facility (backup control center) upgrade solicitation issued.*
5. *Control center facility solicitation issued.*
6. *LMR and microwave technology capabilities report approved.*
7. *Commonwealth responds with upgrade features and requirements.*
8. *Migration plan approved.*
9. *Network radio coverage report approved.*
10. *Radio equipment upgrade procurement documentation approved.*
11. *Radio tower structural analysis completed*
12. *The Commonwealth issues tower and site upgrade solicitation.*
13. *Radio network interface specification approved.*
14. *Data intranet design approved.*
15. *Commonwealth issues the LMR and microwave upgrade solicitation.*
16. *Commonwealth issues the mobile data solicitation.*
17. *Radio coverage acceptance test plan approved.*
18 *Division 1 towers and transmitter sites upgraded.*
19. *Division 1 LMR and microwave networks upgraded.*
20. *Contractor moved Division 1 MCTs to the mobile radios.*
21. *Division 1 LMR coverage verification reports approved.*
22. *Network operation transferred to the new facility.*
23. *Divisions 3 & 5 towers and transmitter sites upgraded.*
24. *Divisions 3 & 5 LMR and microwave networks upgraded.*
25. *Contractor moved Divisions 3 & 5 MCTs to the mobile radios.*
26. *Divisions 3 & 5 LMR coverage verification reports approved.*
27. *Divisions 2 & 7 towers and transmitter sites upgraded.*
28. *Divisions 2 & 7 LMR and microwave networks upgraded.*
29. *Contractor moved Divisions 2 & 7 MCTs to the mobile radios.*
30. *Divisions 2 & 7 LMR coverage verification reports approved.*
31. *Divisions 4 & 6 towers and transmitter sites upgraded.*
32. *Divisions 4 & 6 LMR and microwave networks upgraded.*
33. *Contractor moved Divisions 4 & 6 MCTs to the mobile radios.*
34. *Divisions 4 & 6 LMR coverage verification reports approved.*
35. *1000 additional MCTs fully integrated and operational.*
36. *RF Safety is certified and plan reviewed and modified.*
37. *As-built documentation approved.*
38. *Configuration management and inventory control transferred to Commonwealth*

The following sub-task addresses the work requirements for the above RFP Task.

O.01 Project Milestones

HSMM has developed a comprehensive implementation plan, which takes into consideration all of the project milestones listed in this scope of services.

Task P

P. The contractor should interview the Federal Law Enforcement Wireless Users Group, FLEWUG, and for the purpose of creating shared network operations that would allow them to communicate separately on the Commonwealth's infrastructure. The FLEWUG will provide a single point of contact for the contractor to work with. The contractor shall determine what impact including these new users on the system will have and identify what resources are needed to support these additional users. Approval shall be obtained from the Commonwealth before the FLEWUG users are added to the system design. The Contractor shall prepare the technical and administrative portions of a contract between the Commonwealth and the FLEWUG.

The following sub-tasks address the work requirements for the above RFP Task.

P.01 Interview FLEWUG Agencies

HSMM will interview the federal systems representative at a site in Northern Virginia, to obtain a listing of the inventory of equipment used by the FLEWUG agencies operating on the Commonwealth radio system and to identify growth predictions and existing 'unfulfilled demand' for these agencies. The interviews will also be used to clearly identify all interoperability requirements between FLEWUG and state agencies, and all statewide 'roaming' requirements of the federal users. FLEWUG will provide a single point of contact, who will be empowered to act for all FLEWUG agencies for the purpose of fulfilling this task. We anticipate this will be accomplished in a single work week.

The inventory listing will be confirmed by providing our tabulation to the FLEWUG point of contact for their verification.

P.02 Create Shared Network Operations

HSMM will prepare a report and study to the Commonwealth outlining the impact/benefits of allowing FLEWUG users on the statewide LMR. This will involve a single presentation to the Commonwealth.

HSMM will include all FLEWUG interoperability requirements in the development and design of the statewide radio system. HSMM will establish and maintain a procedure to track the inventory of FLEWUG equipment used on the state system for the duration of the project. FLEWUG users will be accounted for and included in the assignment of system ID's throughout the process. During the interview processes the interoperability procedures will be defined and any new requirements developed. HSMM will also develop interoperability procedures for use during the system's migration periods. These requirements will be organized into a lesson plan for training for FLEWUG users and the state agencies requiring interoperability with FLEWUG users. FLEWUG users will be included in all system training plans. HSMM will include all FLEWUG users and requirements in the various divisional migration plans during the implementation of the system.

Task Q

Q. The contractor's project management staff shall have temporary/permanent offices in the Richmond area.

The following sub-tasks address the work requirements for the above RFP Task.

Q Richmond Field Office Facility

We recognize the need for an office local to the project and the Richmond area. While the offices involved in this project are located quite close to Richmond, an immediate location will be necessary for day-to-day coordination with the Virginia Project Manager, and as a base for the meetings needed for the project. We therefore plan to establish an office facility on the western side of Richmond convenient to the VSP offices. This office could be located in the City of Richmond, Henrico County, or Chesterfield County.

We note that the locations of the HSMM offices throughout Virginia and in North Carolina provide personnel and offices within a two-hour drive of nearly 100% of the Commonwealth. This means that the critical design and research effort can be done in existing HSMM offices convenient to the established HSMM support resources such as our extensive computer network, senior HSMM personnel, a variety of technical specialties for immediate consultation, the HSMM library network, and the records and technical support information gathered from our extensive history of communications work.

This also means that essential local project management functions will be performed by personnel located near the Virginia Project Manager.

Atlantic Tower Corporation, who will be our field partner, is located in Ashland, quite local to the VSP. While we plan to establish the office described below, the ATC offices will provide interim office space until the field office facility is fully established and staffed. We anticipate the field office facility to be established and staffed by the end of the first calendar quarter of the project.

This project has an expected duration of 72 months, in accordance with the schedule contained in Section 3, paragraph N of the RFP. Many of the Richmond office facility costs are time related, and would increase or decrease commensurate with a change in schedule.

Q.01 – Q.04 Establish Richmond Field Office Facility

HSMM will locate a field office in the Richmond area. We will work through a local realtor to find an office space that is located convenient to the VSP offices and access to major north/south and east/west highways. The requirements will include a reception area, offices and workstations, a meeting room, restroom(s), and adequate parking. The location should be convenient to motels and restaurants.

The facility will be equipped with telephones, copier, and fax. The computer system will be equipped with a WAN server and interfaced to the HSMM network to facilitate interoffice document exchange and email.

The office will be the headquarters of the assigned field manager and used by other project personnel as required, and will be staffed with a full-time clerk/receptionist. The office will be maintained throughout the project duration.

The office will include a dedicated four-wheel drive vehicle, which will be used for the VPSLMRN project.

Task R

R. The contractor shall inform the Commonwealth of all relationships with firms involved in the types of products and services identified within. To protect the interests of the Commonwealth, the contractor shall inform the Commonwealth in writing of all assistance and information received, solicited and unsolicited, from such vendors during the contract period and shall provide to the Commonwealth a copy of all information communicated nonverbally during the contract period. The Contractor shall advise the Commonwealth of any areas of the technical documentation provided that may have been influenced by a particular vendor, and identify the vendor.

The following sub-tasks address the work requirements for the above RFP Task.

R. Vendor Contact Considerations

We understand the need for the Commonwealth to maintain control and documentation of vendor contacts, and to understand the information that has been obtained from the vendors. We plan to establish a process that provides that information to the Commonwealth to the extent that it applies to this project.

As a qualified Architectural – Engineering - Communications Engineering firm we currently participate in a number of projects for a variety of clients, nearly all of which require close contact with most of the vendors and contractors that might be involved with the VPSLMRN project. We also regularly attend trade shows and vendor seminars, and research vendor capabilities as a routine matter to maintain our technical expertise and to be informed of the business environment in which we operate. While we normally document all contacts with vendors for our own records, only the documentation with respect to contacts pertaining to or affecting this project will be provided to the Commonwealth.

Independence from all manufacturers, vendors, and dealers of equipment or service who are prospective responders to invitations to bid, propose or present qualifications is a long-standing policy of HSMM and is critical to our position as a leading Architectural – Engineering Consulting firm. We successfully maintain the position of independent designer, specifier, and negotiator while remaining informed of the capabilities and qualifications of companies in the marketplace and independent of them.

R.01 Vendor Contact Reports

HSMM will establish a vendor contact reporting system to inform the Commonwealth of vendor assistance and information received, written or verbal, solicited or unsolicited during the contract period, when such a contact is specific to this project.

R.02 Vendor Documentation Provision

HSMM will issue vendor contact reports to the Commonwealth and with copies of vendor documentation received, for every month in which reportable vendor contact with respect to this project has occurred.

ATTACHMENT B

BASIS OF SCHEDULE OF HSMM FEES

BASIS OF SCHEDULE OF HSMM FEES

The scope of work and the extent of HSMM's and the Commonwealth of Virginia's responsibility are based on the following:

VIRGINIA RESPONSIBILITY AND TASKS:

1. The Commonwealth will appoint a project manager who will be the single point of contact for this project. This individual will coordinate all activities for the Commonwealth, state Agencies, state Law Enforcement, and the non-state entities.

2. The Commonwealth will provide review and approval of submittals and draft reports according to the project schedule, and respond with consolidated comments.

3. The Commonwealth, with the assistance of HSMM as provided in the attached scope of work, will conduct all procurement activities for this project. The Commonwealth will provide information copies of the terms and conditions and all specification boilerplate for the procurement to HSMM so that HSMM is aware of this information and can provide for uniformity and consistency between the technical specifications and general terms and conditions.

4. Geotechnical, subsurface, materials testing fees and the costs of boundary and topographic surveys are the responsibility of the Commonwealth.

5. Filing fees (FCC, FAA) costs of permits, and costs of licenses are the responsibility of the Commonwealth.

6. The Commonwealth will provide access to sites, a guide, will open gates, remove covers, and will provide ladders and safety equipment that is site specific as required by the Commonwealth, except for that required by tower climbers.

7. For any change made to sites, towers, or equipment subsequent to site visits provided under Task C, the Commonwealth must inform HSMM of the nature and details of those changes in an appropriate format.

8. The anticipated duration of this project is six-years and is used as the basis of this proposal and for the planning for the project.

HSMM SCOPE:

1. Consideration for other jurisdictions and joint-use shared systems will be for entities operating generally within the boundaries of the State of Virginia.

2. Except as specifically stated, this scope does not include any effort associated with rezoning property, providing conditional use permits, and obtaining approval of governmental agencies. Additional fees may be required for bidder and contractor litigation and protests.

3. Computerized Propagation studies will be done as part of the effort for Task G, although the files obtained will be used as part of Task B. We will provide a coverage report with our findings. HSMM may, at our option, include a larger number of sites in the selection process. Additional propagation studies requested by and at the option of the Commonwealth may be negotiated as an increase in scope.

4. The objective of the project is the implementation of the LMR System as defined in the Scope of Work. Immediate fixes to the existing system and operations are not included in this scope of work.

5. Except for the Prime Site design that comprises Task E, and the tower structural analysis required under Task I for towers, a detailed structural analysis of buildings, towers, and other facilities is not required. Subsurface investigation is outside the scope.

6. Specifications, except for the interference under Task H, developed by HSMM will be provided to the Commonwealth in hard copy form and as digital files for the use of this specific project only. Specifications are not to be provided to other localities or states for their use in procurement of similar systems.

7. The specification will include wording that will require that if a vendor notifies the Commonwealth that all or part of the system or facilities is complete and ready for inspection or test, and should that prove not to be the case when tested or inspected, the vendor will reimburse the Commonwealth for HSMM charges associated with retest, re-inspection, and resolution of the problem.

8. This scope is based on sufficient review and information gathering meetings in Richmond and on site as described herein to obtain the necessary information and make the necessary decisions pertaining to the project. Additional meetings, at the option of the Commonwealth, are considered an increase in scope.

9. Assistance in licensing is exclusive of license fees and coordination costs, which will be billed as an additional expense. Attorney fees, effort and costs associated with license modifications, effort involved in defending against unexpected interference to or from existing licensees, effort in obtaining special temporary authority (STA), or any effort beyond that coordination

effort described herein may, at the state's option, be authorized as work that is outside the scope.

While HSMM can generally provide some guidance on the availability of radio channels, pursuit of these channels by means other than that of a standard application to the FCC through the normal coordination channels is outside the scope of this project and may require sub-contracting to a legal firm that specializes in such activities.

10. Digital communications and the Use of Magnetic Media.

HSMM currently uses the following computer software:

Microsoft Word 2000
Microsoft Excel 2000
Microsoft Access 2000
CA SuperProject, version 4.0b
AutoCAD, release 14

The software is updated, from time to time, to the current version after coordination with the Commonwealth.

We can provide documentation produced by our computer systems on magnetic media or CD-ROMs in formats of other computer systems. Such files will be provided as export files into the formats of the other computer systems. The controlling documentation will be a hard copy. We are not responsible for the effects of exporting files to the formats of the other computer systems. This conversion process might result in format, reference or calculation errors.

HSMM has the ability to send and receive E-mail messages. For purposes of security, we prefer to provide and receive sensitive or critical information either by facsimile, mail, or direct modem connection. E-mail will be checked on a periodic basis, at least once a day.

Any information sent by E-mail with critical timing requirements should include also a facsimile to the appropriate recipient alerting them that there is an E-mail message waiting.

11. The fee schedule assumes that the user agencies include19 state agencies and they are considered to be primary users. Federal agencies and are considered to be secondary users. There will be a single point of contact for all federal agencies.

12. Abbreviated Needs Assessment for inclusion of City or County in COV system. Provides for determination of Public Safety two-way radio communications needs of the locality. This includes:

- Quantity of radios by type and department
- Number of talk-groups

- Current and projected radio traffic volume
- Service area
- Dispatch requirements (assumes worst case of wire line or microwave access to VPSLMRN)
- Summary letter report of needs assessment findings

This needs assessment assumes that the VPSLMRN will provide service to the locality without modification of location of tower sites and within the context of the overall VPSLMRN design. Capacity of the VAPSLMRN in the service area of the locality will be adjusted to accommodate the public safety two-way radio communications needs of the locality. Other design parameters will not change.

Fee schedule does not include:

- Travel and per diem expenses.
- Formal presentation to the locality
- Complete VPSLMRN needs assessment report

13. Invoicing/Payment Expectations

Early in the project, HSMM will establish a Schedule of Values in conjunction with the project Schedule and detailed task descriptions. This schedule of Values would consist of major project Milestones. We would expect to add such items as deliverables, reports, specifications, analyses, solicitations, and intermediate points of a percentage of completion. This schedule of values would be created such that they would be used as reasonable project reporting points.

The Schedule of Values would also have a monetary value based on the total consultant fee for a task and the staff effort required to complete the item. Thus, the schedule of values would be a more detailed breakdown of the quoted fee for a task and would be the basis of invoice preparation.

See section two, General Terms and Conditions, paragraph H.1.e.

14. A Tower Analysis Account of $300,000 is part of Task I fees and is based on analysis of approximately 50 towers at an average cost of $6,000 each. Tower analyses will be billed at the "additional services" rate.

15. Effort that is related to subscriber unit count is predicated on the quantities contained in schedule A, +/- 4 percent.

16. The effort described herein assumes the existing 87 VSP sites plus a maximum of 12 new sites.

THE COMMONWEALTH AND HSMM AGREE THAT THIS SCOPE OF SERVICES DOES NOT INCLUDE ANY REQUIREMENTS FOR:

1. Consideration for other jurisdictions and joint-use shared systems and interoperability other than those specified herein

2. Detailed documentation of the existing system, except as provided for as part of Task C. Evaluation of, and recommendations for, existing system maintenance is not required.

3. Short-term recommendations for modification and improvements to the existing system and operations. Short-term plans and budgets are not required.

4. Planning and designs for 9-1-1, GIS, AVL, and EOC facilities and systems.

5. Analysis of the effect of towers on local AM broadcast stations, if any.

M:\FILES\91031\Negotiations\Contract\6-VPSLMRN-Prop\Basis of Fees - Rev5.doc; 07/07/00

SCHEDULE A, SUBSCRIBER UNIT COUNT
Virginia Public Safety Land Mobile Radio Network

June 26, 2000

Divisions Mobile Radios	State Police	Corrections	Conservation & Recreation	Game and Inland Fisheries	Alcoholic Beverage Control	Transportation	Emergency Services	Forestry	Marine Resources	Motor Vehicles	Health	Mines, Minerals and Energy	Capitol Police	Totals	Total Mobile & Portable Units	Number of Channels Required
Richmond	534	298	44	70	42	1176	50	30		40	10		10	2304	3283	27
Culpeper	210	117	17	28	17	462		120						971	1388	12
Appomattox	191	106	16	25	15	420		60						833	1171	10
Wytheville	210	117	17	28	17	462		150				135		1136	1582	14
Chesapeake	324	181	27	43	26	714		60	268					1643	2299	20
Salem	229	128	19	30	18	504		150						1078	1548	13
Fairfax	210	117	17	28	17	462		30						881	1223	10
Total, Mobiles	1908	1064	157	252	152	4200	50	600	268	40	10	135	10	8846	12494	106

Portable Radios

Richmond	534		47	56	28	140	50	25			10		89	979
Culpeper	210		19	22	11	55		100						417
Appomattox	191		17	20	10	50		50						338
Wytheville	210		19	22	11	55		125				4		446
Chesapeake	324		29	34	17	85		50	117					656
Salem	229		20	24	12	60		125						470
Fairfax	210		19	22	11	55		25						342
Total, Portables	1908	0	170	200	100	500	50	500	117	0	10	4	89	3648

Total, MCTs	1431													1431

Total, Grand	5247	1064	327	452	252	4700	100	1100	385	40	20	139	99	13925

Information taken from the Implementation Plan for a Statewide Shared Land Mobile Radio System, November 9, 1998, page 55.
VSP portable radios and Capitol Police mobiles not included in the in the number of radio channels calculation.

ATTACHMENT C

SCHEDULE OF FEES/ADDITIONAL SERVICES

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Schedule of Fees

Task	Fee
A. Perform radio asset inventory, needs assessment, and project expected growth.	$295,266
B. Document existing radio frequency authorizations. Devise a frequency reuse strategy. Determine the capacity of the channels. Obtain additional channels if required. Ensure non-interference. Develop a channel plan.	$474,143
C. Evaluate and document the State Police combined radio infrastructure	$744,849
D. Perform microwave and LMR technologies assessment.	$564,943
E. Design and document the facility upgrade for the network. Design and document the new facility for the network. Transfer operations to the new facility.	$20,684
F. Prepare a migration plan.	$302,523
G. Design an upgrade to the existing VSP LMR and microwave networks. Document the designed coverage of the network. Add any new LMR or microwave sites that are required. Create the required technical procurement documentation. Perform coverage testing on the completed network.	$5,915,223
H. Design a network interface. Create a network interface specification.	$61,752
I. Perform a tower structural analysis. Generate the tower technical procurement, FAA and FCC documentation.	$4,657,062
J. Integrate existing mobile data equipment into the upgraded radio network. Integrate mobile data infrastructure into the State Police data infrastructure. Plan for the removal of the wireless modems from the patrol vehicles. Coordinate the mobile data transmissions using the upgraded radios. Verify converted systems effective operation. Update the technical mobile data procurement documentation. Prepare documentation to obtain and install 1000 MCTs. Inventory, oversee the MCT installation into the VSP patrol vehicles. Verify the testing of the additional 1000 mobile computer terminals. Develop an inter/intra agency data intranet using the microwave network.	$898,929

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Schedule of Fees

Task	Fee
K. Perform acceptance testing on all deliverables. Create and implement inventory control and configuration management. Program the new equipment with the channel plan and/or talk groups. Implement the new channel plan. Provide operator train-the-trainer training. Ensure RF safety compliance. Edit the RF radiation Compliance Plan.	$2,653,482
L. Maintain the project schedule and budget. Submit monthly reports and attend monthly meetings.	$2,123,741
M. Document the as-built design, infrastructure, network, systems, subsystems, software, firmware, and equipment.	$404,390
Q. Provide temporary/permanent offices in the Richmond area.	$833,209
R. Vendor/Commonwealth Interface	$117,165
GRAND TOTAL FOR ALL WORK	$20,067,361
K. Project Specific Insurance	$295,000
P. Costs to interview FLEWUG, and create shared network operations, if proposed.	$109,207

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Additional Services

Task	Description	Fee (at 2000 rate)
A.02	Abbreviated Needs Assessment for inclusion of City or County in COV system.	$24,500
G1.101	Additional Microwave Path Survey beyond 24	$3,230
I.01	Tower inspection and analysis, each tower.	
	Guyed Towers	
	50' to 200' high	$6,500
	200' to 300' high	$6,875
	300' to 400' high	$7,500
	400' to 500' high	$7,875
	Self Supporting Towers	
	50' to 200' high	$6,250
	200' to 250' high	$6,875
	Above 250' high	$7,500
	Monopole Towers	
	All heights	$4,125

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 29, 2000

HSMM SCHEDULE OF RATES

Project Manager	
Communications	$123.54
Architecture/Engineering	$115.28
Senior Level	
Communications Engineer	$112.26
Architect	$82.07
Engineer	$88.00
Staff Level	
Communications Engineer	$84.21
Architect	$69.03
Engineer	$70.97
Field Engineer	$80.86
Support	
Technician	$70.75
Technical Writer	$46.83
Draftsperson/CAD	$61.44
Cost Estimater	$70.97
Clerical	$38.08
Services	
Coverage Analyses, each site (includes labor)	$500.00
Simulcast Analysis, each cell (includes labor)	$500.00

Notes:

1. Rates are for calendar year 2000.
2. For work done after January 1, 2001, rates will escalate based on the IEEE-USA Salary Survey applicable to the most recent year surveyed. The 10 year average 1989-1999 was 4.9%.
3. Expenses will be billed at cost and travel will be billed in compliance with the VA travel code.

ATTACHMENT D

EQUIPMENT LIST

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Equipment List

POWER METERS/WATT METERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
75174	BIRD ELECTRONIC	WATTMETER	6
53089	BIRD ELECTRONIC	CARRY CASE	2
96605	BIRD ELECTRONIC	ELEMENT, 100-250 MHz, 25 W	4
66955	BIRD ELECTRONIC	ELEMENT, 100-250 MHz, 100 W	6
84115	BIRD ELECTRONIC	QUICK CHNGE CON. UHF-MALE	6

LOADS, ATTENUATORS, SIGNAL SAMPLERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
49317	TELEWAVE	CONNECTOR, UHF-MALE	6
45823	EMR CORP.	CONNECTOR, N-FEMALE	2
79644	BIRD ELECTRONIC	FIELD STRENGTH METER	2

ITEM	MANUFACTURER	DESCRIPTION	QTY
39751	LP TECHNOLOGIES	W/ TRACKING GEN. AND AM/FM RECEIVER	2

ANTENNA TESTERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
55765	HELPER INSTRUMNT	775 TO 1025 MHz W/RECHARGE. BATT.	2

GROUND RESISTANCE TESTER

ITEM	MANUFACTURER	DESCRIPTION	QTY
56338	AEMC	DIGITAL GROUND/SOIL TESTER KIT	2

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Equipment List

SERVICE MONITORS

ITEM	MANUFACTURER	DESCRIPTION	QTY
23830	IFR	COM 120B-3T, W/ COVER AND BAIL	2
92098	IFR	AMPS MOBILE TEST OPTION	2
43715	IFR	IFR 500 W/ RECH.BATT.	4
64182	IFR	TELESCOPING ANTENNA FOR ABOVE UNITS	2
96243	IFR	HARD TRANSIT CASE FOR ITEM 23830	2

TEST CABLES/TOOLS

ITEM	MANUFACTURER	DESCRIPTION	QTY
67226	TESSCO	UHF/M-UHF/M	30
65977	TESSCO	N/M-N/M	30
49078	CELLDYNE	SITE ENGINEER'S TOOL KIT	6
71894	WOODS	100 FOOT EXTENSION CORD	2

ITEM	MANUFACTURER	DESCRIPTION	QTY
97328	WAVETEK	ST75 "MINI-STICK" AUTORANGING	6

FREQUENCY COUNTERS

ITEM	MANUFACTURER	DESCRIPTION	QTY
61401	OPTOELECTRONICS	MICROPROCESSOR BASED W/ DIG.COUNTER	2
53448	OPTOELECTRONICS	CARRY CASE FOR ABOVE	2
95695	OPTOELECTRONICS	TELESCOPING ANTENNA	2

RECEIVER ALIGNMENT INSTRUMENTS

ITEM	MANUFACTURER	DESCRIPTION	QTY
40053	HELPER INSTRUMENT	SINAD METER, 0-20dB, 120 VOLT	4
13625	HELPER INSTRUMENT	INAD METER, 0-32dB W/TONE GEN., 120 VOL	2

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Equipment List

VAN EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
59543	CROWN	COMPLETE VAN SHELVING PACKAGE	2
N/A	OLYMPUS	DIGITAL CAMERA	2
N/A	OLYMPUS	MEMORY CARD	2

SHOP EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
85593	PANAVISE	STANDARD BENCHTOP VISE	4
95602	WELLER	SOLDER GUN	6
98049	3M	WORK STATION GROUNDING KIT	4
77603	CHARLESWATER	FIELD GROUNDING KIT W/ CARRY CASE	2
18501	KENWOOD	SWITCHING POWER SUPPLY	4

SHOP EQUIPMENT (TECHNITOOL CATALOG)

ITEM	MANUFACTURER	DESCRIPTION	QTY
664BE013	TECHNI-TOOL	30"x72" DOUBLE-SIDED WORKSTATION	2
664BE020	TECHNI-TOOL	72" POWER BAR	4
664BE022	TECHNI-TOOL	72" RAIL FOR HOLDING BINS	4
664BE030	TECHNI-TOOL	72" SOLID METAL SHELF	4
664BE018	TECHNI-TOOL	72" OVERHEAD LIGHT SYSTEM	4
284L1201	CIRCLINE	CIRCULAR ILLUMINATED MAGNIFIER	4
190BE8601	TECHNI-TOOL	30" HEIGHT ESD CASTER CHAIR	4
XF502286	TECHNI-TOOL	60"x30"x33" INSTRUMENT TRUCK	2

TEST SETS (GRAYSON ELECTRONICS)

ITEM	MANUFACTURER	DESCRIPTION	QTY
1374	GRAYSON	SPECTRUM TRACKER UNIT-VHF	2
	(VENDOR)	VHF MOBILE RADIO UNIT FOR ABOVE	2

Virginia Public Safety Land Mobile Radio Network
Design, Implementation, and Quality Control Consultant

June 26, 2000

Equipment List

MICROWAVE TEST EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
80872	UTICA	TORQUE SCREWDRIVER	6

HEWLITT PACKARD MW TEST EQUIPMENT

ITEM	MANUFACTURER	DESCRIPTION	QTY
HP	HEWLITT PACKARD	FREQUENCY COUNTER	2
HP	HEWLITT PACKARD	BIT ERROR RATE TEST TEST	2
HP	HEWLITT PACKARD	POWER METER	2
HP	HEWLITT PACKARD	OSCILLOSCOPE	2
HP	HEWLITT PACKARD	TIMS	2
HP	HEWLITT PACKARD	SIGNAL GENERATOR	2
HP	HEWLITT PACKARD	ATTENUATORS	2